GAS JOURNAL

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FESTIVAL FOLLY

WHEN, a few months ago, we expressed our misgivings at the almost complete absence of gas interest in the Press releases relating to the forthcoming Festival of Britain, it was with the hope that later reports would cast more light on the subject, making good this serious omission. Here is an exhibition which purports to show how 'British achievements in science, technology and industrial design have resulted from the initiative of the British people in developing the resources of their land'—a theme, one might say, peculiarly suited to the gas industry. And yet in the quite voluminous description of exhibits gas receives no more than a passing mention, with no indication of how this industry, so important to our national economy, is to be represented. The picture was thus outlined in the vaguest terms, but the announcement of an address by Sir Edward Appleton on January 26 raised hopes that at least some of the necessary detail would be sketched in. Alas, these hopes were in vain. Sir Edward added nothing to our meagre knowledge of the Festival, nor was his speech the signal for the release of more information from the Festival's publicity department.

When the Festival of Britain was first discussed, 1951 appeared to be a distant date, comfortably remote. It is distant and remote no longer. In fact, knowing how slowly these things must evolve, the exhibition might be said to be imminent, and its form should have been crystallised. On the assumption that the panel of designers is keeping up to schedule and that preparations are well in hand, why should the undertaking be shrouded in mystery? It was with these thoughts in mind that we decided to probe into the matter, not with the object of revealing something best left in silence a little longer, but to find out whether there was anything there in the first place. Moreover, we determined to advance along a normal and legitimate trail, for the Festival authorities have a Press Office and all the machinery to deal with such enquiries as ours.

Our questions were simple and straightforward: In what way will the gas industry be represented at the Festival of Britain? Will the carbonisation process be clearly shown? Will the exhibition recognise the contribution of gas service to industry, and if so, how? And in what way will the Festival demonstrate the essential part played by gas in the daily lives of ordinary people?

It is with regret that we admit our efforts were largely in vain. Not because of inexplicable secrecy or red tape, but because nobody knew the answers. The Press Office made valiant attempts to unearth some obscure backroom boys who might know something about the gas exhibit; none was to be found. Replies were always evasive. The design was not completed; the space was so limited; the difficulty was to achieve a balance; only the rough contours of the section had been decided. The Council of Industrial Design is responsible for the Homes and Gardens section, which embraces domestic utilisation, but 'it is too early to say anything definite.' The Gas Council has been consulted but nothing constructive has yet transpired.

Despite this lack of success, a few facts were gleaned. For example, gas will appear in three sections of the exhibition—the natural resources section for coal gas generation, the industry section for illumination and industrial heating, and the home section for domestic equipment. Space for the natural resources section will be very limited, and 'the gas industry will be represented by animated diagrams in showcases on the walls near the model mine shaft.' Not very impressive. The section dealing with illumination will be small and partly historical in character, and as such unlikely to reflect much glory on our industry. Of the industrial section nothing is known, but the homes section will, not surprisingly, consist of a series of rooms in which, we may presume, gas equipment will be shown.

It would appear, therefore, that the gas industry, although largely British in origin, is unlikely to receive treatment in keeping with its impressive development and contribution to our civilisation. If progress is not made soon with the exhibit, it will not be represented at all! It is of interest to note that electricity, which will (quite understandably) play a much larger part in the Festival, has its plans well laid.

SOUTH WESTERN PRICES

NOTICES of alterations in the prices of gas within the area of the South Western Gas Board were published on February 3, to take effect as from the meter readings on and after February 13. Consumers in 68 districts will be called upon to pay more for their gas, while those in 36 districts, in many of which the price was considered to be abnormally high and not competitive with other fuels, will benefit from a reduction. These, or very similar, price revisions were announced some months ago, but because a Member of Parliament raised a legal question as to whether the published notices contained all the information to which the Gas Act stated that the consumers were entitled, the notices were withdrawn and the area board had to start again. As the board's financial year ends on March 31 its first year's accounts will reflect only to a very small extent the effects of the price adjustments.

As Sir George Evetts pointed out in our Annual Review number the Gas Act requires that each area board shall pay its way taking one year with another, which is exactly what the undertakings did prior to the war, not necessarily to the extent of earning the full capital charges in any particular year. The problem is not quite the same in an area board, insofar as it is not essential for each unit to pay its way. Nor is it necessary that under all circumstances the accounts of the boards must balance every year, but it is intended that over a period of years the accounts must balance. The new prices will, as nearly as can be calculated, only just meet the board's outgoings in a full year, based on the costs when it took over on vesting day, plus an additional £100,000 due to the increase in the cost of coal as from May 30. The board has been investigating the whole question of the production of gas in the south west and contemplates reductions in the cost of production and long-term economies as the result of integration which, however, will take time to accomplish. It has already saved nearly £30,000 per annum as a result of the reorganisation of its coal deliveries, and overhead costs of management are no more than they were prior to nationalisation.

THE GAS HOUSE

WE wonder whether the chief executives of the larger gas undertakings (into whose hands the destinies of the entire industry are now so largely committed) fully realise the position of the engineer and manager of the smaller undertakings in regard to housing. A very large proportion of the works built in the nineteenth century, that is to say, nearly all of those in question, included a house for the manager. He was expected to live on the works. The gas house, as it was often known in the little town, was often a pretty good one. True, it was built with no more idea of suitability to the use of gas for cooking, water heating, and space heating than was usual at the time. Mostly those uses for gas had not arrived when these houses were built. It was, however, often engineer-built—that is to say, the structure itself was substantial and roomy. But not always. We have in mind one gas house, which we often visited to our great delight in our early boyhood and later, which had been built on the lines of a workman's cottage with the office occupying one of the ground-floor rooms. A modern wing had just been added to it, but the office remained until a new works was built some distance away—in the early years of the present century. In the days of the hand-charged horizontal retorts, the gas house periodically nearly disappeared in a cloud of smoke from the retort house which lay just across a rather small yard. We wonder now—it did not trouble us then!—how the gracious lady of the house managed to keep it so beautifully clean.

Many of the newer gas houses are better situated in this respect and the retort house has lost much of its smoke-belching terror. But still remains, dust. The capacity of many of these works has increased two, three, or more fold since they were laid down. Gas-making, and therefore coal and coke handling, capacity is that much more concentrated and with them the density of dust in the atmosphere. In many cases, of course, the engineer and manager has taken a house in the town away from the works, abandoning the gas house to the works superintendent or foreman. It is probable that the gas house is an institution which is passing away. But whoever lives on the works is condemned to an uphill fight against dust, and only those who have experienced it know through what fine crevices and with what persistence coal and coke dust can penetrate a house in the vicinity of the retort house. The gasworks is no site for a 'desirable residence.'

Looking at the question from the point of view of that very high proportion of our technical brethren who are in charge of undertakings with an annual capacity of, say, 250 mill. downwards, there remains a dilemma. Either they must continue to occupy the gas house or seek accommodation elsewhere. And here, indeed, is a problem—a problem shared, no doubt, at this time, by technicians of most industries and shared, too, by the junior personnel of even the largest gas undertakings. We are only calling attention to something of which every serious person is surely aware if we point to the position of the young gas engineer—it is particularly the *young* technician—because it is he who is expected to move from one town to another, at intervals of three or four years, two, three, or more times before he settles down into something like a permanent position. This mobility is, we hope, likely to increase rather than decrease under the new régime. We hope that the uphappy division between big-works men and little-works men will be broken down. There is everything to be said for every young gas engineer being required to manage a little works, on as much of his own responsibility as practicable, during some part of his career. He will get in that way, as in no other, an overall view of the industry in the service of the consumer which is impossible to the departmentalised man of the big works. But his heart may well sink if, with a wife and one or two young children, he has to face the problem of finding a house in a strange town every time he moves—even if, indeed, he ever succeeds in finding a house. He is much more likely to have to face living in rooms—a ghastly experience—for some years.

If there is still a gas house he is likely to seize the opportunity of sheltering himself and family in it, however

meagre its amenities and to however arduous a struggle with dirt it condemns his wife. But—and here is a risk—should this state of things get fully known among young men entering industry, choosing a career, is it likely to attract them into our industry? Even those already in the industry look askance at jobs with no house attached. Many administrators must by now be aware of cases where advertisements of such jobs have brought no offers at all.

It may be said that the housing shortage will pass. We think it will, but not for some years yet. In the meantime the only solution of the problem seems to be the reinstatement of the gas house—in another form. There are, we know, quite a number of progressive undertakings who were making it their business to build, or buy, houses which they could let to the senior and technical members of their staffs. If sufficient mobility is to be maintained among the technical personnel of the industry this policy must be continued and extended in nearly every case. The young gas engineer cannot be expected to find £2,000 to £3,000 to buy a house, and he should not be expected to put up with digs if he is a married man. And we want him to be a married man with a family and a vital stake in the industry.

BRASS TACKS

NATIONALISED industries are reputed to make no profits; hence the old claim that profits are made in the retort house loses some of its significance. No change in structure, however, can alter the basic economic factors of gas manufacture, and what happens in the retort house remains of paramount interest to the gas engineer. It is a well established fact that of all the attractions offered by the district associations, and perhaps more especially by the Southern Association (Eastern District) in whose territory the world's largest undertaking operates, a paper from a station engineer on the day to day operation of the manufacturing plant is the most popular. Gatherings of wider national importance deprived the Eastern District of Room 1 at Gas Industry House on January 24, but there was a full-to-overflowing 'house' in Room 3 to hear the paper by Mr. H. W. Moys on 'Plant Improvements on a Medium Sized Gasworks,' in which he told a vivid story of the past 17 years' modernisation of the Bromley works, built 80 years ago by the Imperial Gas Company in opposition to Beckton. Mr. Moys focussed attention more particularly on the application of the principle of recirculation of waste gases in horizontal retort settings, but his whole picture was romantic. Bounded by docks and slums, the works stands on an exceptionally spacious site of 167 acres on which the early plant builders so spread themselves that they imposed on their successors all sorts of problems concerning the handling of materials from one part of the site to another.

Ever since 1870 the coal carbonising plant at Bromley has been restricted to horizontal retorts, with a present total capacity of 20 mill. cu. ft. per day, plus a water gas plant of four automatic self-clinkering 2½ mill. cu. ft. per day sets and a producer gas unit of 1¼ mill. cu. ft. per day. Vertical retorts are, however, now being installed to add 7½ mill. cu. ft. per day to the capacity of the works, with provision for the addition of a further similar unit. There is enough ground area to build the retort houses and all the ancillary plant without encroaching on existing plant. The Bromley works appear to have had the reputation of teaching gas engineering the hard way. However true that may be it is obvious from Mr. Moy's paper that gas engineers elsewhere can turn to Bromley for guidance in the solution of their everyday problems.

FIELD'S ANALYSIS

THE issue for 1948 containing the working results of company undertakings for the year ended December 31, 1948, and for local authority undertakings for the year ended March 31, 1948, has just reached us. Now that the gas industry is nationalised this is the last edition of a most important and valuable compilation of figures carrying the stamp of accuracy and authority and serving as a constant source of reference. Apart from war years when publication was prohibited, Field's has been produced every year for three quarters of a century, and a study of the series reveals the strides made during the past 80 years in spite of the difficult periods through which the industry has passed. The sale of gas has continued to increase, most undertakings now selling more gas than at any other time in their existence. If further issues of Field's had been possible they would have recorded the accelerated expansion of the individual undertakings listed. No doubt statistics for the industry will be issued in future years by the Gas Council and the area boards, and it is to be hoped that the grouping of undertakings will not result in the withholding of figures relating to individual undertakings within these groups. However, we can hardly expect such a comprehensive analysis of results as set out in Field's for the 34 principal undertakings selected.

Field's has certainly set a high standard, and once again we extend our heartiest congratulations to the compiler, Mr. O. W. Wells, and his assistants on the way in which they have carried out their task. The standard set by the original compiler, John Field, has been maintained throughout the years, a remarkable record, and one of which all concerned with the publication, including the printers, can be justly proud. The Analysis is now on sale at the pre-war price of £2 2s., and orders should be sent to the publishers and printers, Eden Fisher & Co., Ltd., 6, 7, and 8, Clements Lane, E.C.4.

THE BRACKET FIGURE

IN the course of a statement on the coal output for 1950 reported in the *Journal* a fortnight ago, Lord Hyndley, Chairman of the National Coal Board, said that he favoured 'a bracket of 205-210 million tons' as 'a realistic forecast' for the year. A performance equalling this target would maintain the continued process of output expansion which we have witnessed since the industry was nationalised in 1946, rising from 181 mill. tons to more than 202 mill. tons last year, and the equivalent of a 3% increase each year. In the achievement of these figures the miners have got off to a good start. In the first four weeks of this year output of deep-mined and opencast coal has totalled 16,933,100 tons, as against 16,513,400 tons in 1949. This increase over last year of some 400,000 tons in four weeks, if maintained, will bring the final production well into Lord Hyndley's suggested

bracket target. This extra output has been achieved in spite of a decline in mining manpower which has continued at an increasing rate. During the week ended January 21 600 men, all of them face workers, left the pits. In the preceding week the number dropped by 400, including 200 face workers, offsetting the rise of 300 in the first week of the year. Latest figures from the Ministry of Fuel and Power show that total employment on January 21 was 708,200, with 292,800 at the coal face, the lowest level since the beginning of 1947. Since the end of last year the 'ring fence' has been removed from the coal industry, leaving the miners free to leave the mines as and when they wish. There is at yet no indication as to what proportion of the manpower loss incurred so far this year is due to this lifting of control, as against normal wastage. It is, however, obviously having some effect. The manpower trend thus noted also confirms another opinion expressed by Lord Hyndley when he said: 'We shall probably finish the year with about 700,000 men on the books.'

A DIFFERENCE OF OPINION

Lord Hyndley and the Coal Board see no reason for concern in this persistent and expected drop in manpower, which they believe may be more than offset by the benefits from increased mechanisation in the mines. In this they differ from the miners' unions which on several occasions have expressed their dissatisfaction, stressing in particular the need to increase the flow of young recruits to the industry. One effect of the removal of the 'ring fence' is that men whose call-up for military service was deferred because they are in the mines will become liable for service if they leave the industry. Apart from this incentive to stay, a scheme to raise the technical standards of tradesmen in the coal industry, announced by the N.C.B. last week, may well add to the attractiveness of a career in the mines. Proposed qualifying examinations include a general certificate taken after a three-year part-time course, and an ordinary national certificate intended as a preliminary to a higher national certificate. It is hoped to relate these certificates to the ordinary and higher certificates held under the aegis of the Institution of Mechanical Engineers. Whatever the outcome of the manpower problem may be, given better co-operation between management and men than was apparent last year, the maintenance, if not improvement, of last year's export figures, and improved attendance, we consider that the year's objective should be achieved, not only in part but completely.

Personal

Alderman Mrs. **M. C. Irving** (Tottenham), a member of the Eastern Gas Consultative Council, has been appointed Deputy Chairman of the Council.

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Professor **R. J. Sarjant,** O.B.E., D.SC., F.INST.F., Professor of Fuel Technology at the University of Sheffield, has been awarded the Melchett Medal of the Institute of Fuel for 1950.

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Mr. **Frank Wright,** a fitter employed by the East Midlands Gas Board, of Mansfield, has been appointed a magistrate for the Borough of Mansfield. He has been Secretary of the local branch of the National Union of General and Municipal Workers for some years.

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Mr. **Thomas Stewart,** who has been Manager of the Skelmorlie and Wemyss Bay undertaking for the past 10 years, has been appointed District Manager of the Kilwinning undertaking in succession to Mr. **Dugald M. Rowan,** who was earlier appointed District Manager of the Nairn undertaking. Mr. Stewart received his training at Fauldhouse gasworks, and since his appointment to Skelmorlie has carried out considerable improvements, both on the works and distribution side of the undertaking.

Obituary

Mr. **Alfred A. Kirkham,** who was manager of Enniscorthy Gas Company from 1914 until his retirement in 1946, has died at the age of 70. His father had been Manager of the gas undertakings at Midleton, County Cork, and Carlow.

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Mr. **William T. Hallam,** of Kempston, Beds, from 1928 to 1941 Distribution Engineer with the Bedford Gas Company, died on January 26 at his home, at the age of 54. On leaving school he was articled to the Gorleston and Southtown Gas Company and in 1923 he joined the Singapore Gas Department, where he remained until going to Bedford in 1928.

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Mr. **Charles A. Wilson,** one of the most prominent all-round sportsmen in the Windermere district, who has died at the age of 86 years, was the son of the late Mr. C. Wilson, founder of Messrs. Wilsons and Mathiesons, Ltd., gas engineers, Leeds. He became one of the branch Directors and was a Director of the firm at the time of his death. Mr. Wilson some years ago broadcast a review of his sporting life under the title of 'Seventy Years of Sport.' He excelled in swordsmanship. For three times in succession, representing his country, he won the Olympic Games sabre championship.

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Mr. **John Gibson,** Manager of the Maybole undertaking, Kilmarnock Group, and a former Provost of the town, has died. He was 72, a native of Catrine, and had been connected with gas undertakings for half a century. He had been successively Manager at Dalmellington and Kirkcudbright before being appointed to Maybole, a post he filled from late in 1914 until his death. Mr. Gibson entered the Town Council of Maybole in 1926, and subsequently was appointed a bailie, and in November, 1942, he was appointed Provost. He did not serve a full term as ill health compelled him to give up in 1944.

Diary

Feb. 10.—London and Southern Junior Gas Association: 'Heat and Water Vapour in Crude Gas,' F. E. Craddock (Research Laboratory, Fulham Works, North Thames Gas Board), 178-180, Edgware Road, 7 p.m.

Feb. 11.—Midland Junior Gas Association: Dinner and Social Evening. Imperial Hotel, Temple Street, Birmingham, 6 p.m.

Feb. 13.—West Midlands Gas Consultative Council: Committee Room, Gas Offices, Edmund Street, Birmingham, 2.30 p.m.

Feb. 14.—Scottish Junior Gas Association (Western District): Evening visit to Hoovers, Ltd., Cambuslang.

Feb. 14.—Midland Junior Gas Association: 'Civil Engineering Contracting for the Gas Industry,' W. H. G. Roach and R. Y. Stevens (Wm. Press and Son, Ltd.).

Feb. 16.—Midland Association of Gas Engineers and Managers: 'Making the Best Use of Existing Plant and Providing Extensions with Maximum Economy,' S. K. Hawthorn. Queen's Hotel, Birmingham, 2.30 p.m.

Feb. 18.—Yorkshire Junior Gas Association: Three Short Papers, F. E. Lodge, M. Williams, and R. Hodgson. Bradford.

Feb. 22.—London and Southern Junior Gas Association: Visit to North Thames Gas Board's Meter Repair Works, Pound Lane, Willesden, N.W.10, 2.15 p.m.

Feb. 25.—Western Junior Gas Association: Joint Meeting with Wales and Monmouthshire Junior Gas Association. 'Mainlaying,' R. McAfee (Bath); 'Coke Oven Practice,' J. V. Drake (Bedwas); 'Comparative Performance of Iron Oxides,' A. G. Gaston (Bath).

Feb. 25.—Scottish Junior Gas Association: Joint Meeting of Eastern and Western Districts. Morning visit to Falkirk Gasworks. Afternoon meeting, 'The Administration of the Scottish Gas Area,' Sir Andrew Clow, Chairman, Scottish Gas Board. Falkirk Gas Showrooms.

Domestic and Industrial Show at Hawick

THE South Eastern Division of the Scottish Gas Board staged a large-scale exhibition in the Hawick Town Hall during the week commencing January 17. The exhibition was opened by Provost Fraser, of Hawick, in the presence of Sir Andrew Clow, Chairman of the Scottish Gas Board. Sir Andrew was accompanied by Mr. D. D. Melvin and Mr. James Campbell, members of the Board, and Mr. D. J. Colvin, Divisional Controller. Mr. Robert Cowie, District Manager introduced Provost Fraser.

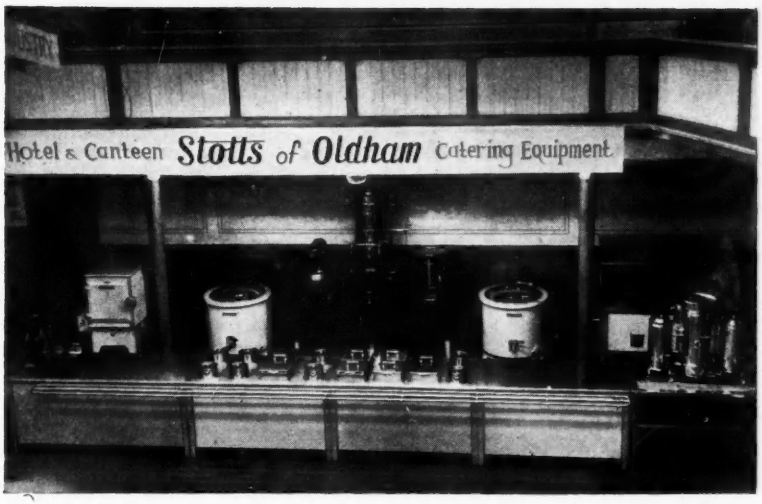
Sir **Andrew Clow,** in thanking the Provost for opening the exhibition, announced that the board had approved of a scheme to improve the gas supply costing £35,000. The first part of the scheme, to cost £19,000, would begin shortly. This was necessary because in the last 10 years the consumption of gas in Hawick had doubled; an increase due mainly to domestic consumption.

The exhibition was on a very full scale. The central illuminated tier carried the insignia of the Scottish Gas Board and the letters G A S. On the platform surrounded by Radiant space heaters was a hot water cascade display which was first shown by the Scottish Gas Board at the Perth exhibition. Through the good offices of the Gas Council, Mr. and Mrs. Stavordale gave throughout the run of the exhibition much appreciated puppet shows featuring Mr. Therm. In a small hall behind the stage Miss Richmond, of Edinburgh, gave three cookery demonstrations per day. These were very popular.

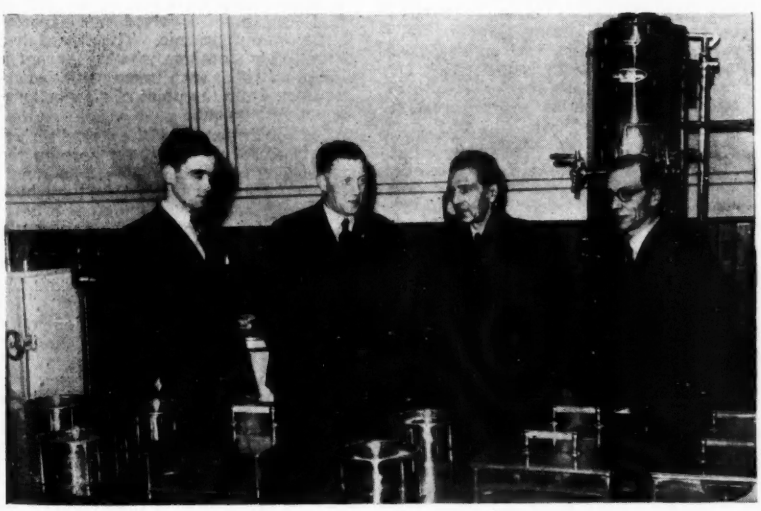
In an adjoining room the ramifications of the gas industry were indicated by a by-products display. Coke was not forgotten since this room showed a coke fire in operation and other coke burning appliances. Some 3,000 people visited the exhibition in the course of its five-and-a-half days' run and considerable interest in all sections was shown.

Gas managers from all the surrounding undertakings visited the exhibition and Mr. D. J. Colvin presided at an informal meeting and a useful discussion took place. In the evening a lecture to these gas managers and members of their staffs was given by Mr. Parker, of James Stott & Co. (Engineers), Ltd., Oldham, dealing with the maintenance of the catering equipment and special features which were likely to be of use to salesmen and others in improving the service to caterers.

The outstanding exhibit was a display of heavy duty, modern, automatic, catering equipment manufactured by James Stott & Co. (Engineers), Ltd., of Oldham. These appliances are being installed in the new canteen of Innes Henderson &



The hotel and canteen catering equipment stand of James Stott & Co. (Engineers), Ltd., at the Hawick exhibition.



This photograph was taken at the lecture given to sales and fitting staffs from neighbouring gas undertakings. Left to right: Mr. W. Spreckley, James Stott and Co. (Engineers), Ltd.; Mr. Parker, the lecturer; Mr. D. J. Colvin, Divisional Controller, Edinburgh and South East Division, Scottish Gas Board; and Mr. Robert Cowie, Engineer and Manager, Hawick District.

Co., Ltd., Hawick. The range included a 21 ft. 6 in. service counter, comprising hot and cold sections, the hot cupboard top fitted with dishes for serving prepared food. Great interest was expressed by many caterers in this exhibit, in particular the counter top, dishes, and tray rails manufactured entirely from stainless steel. White lift-out type enamelled doors mounted on roller bearings, and cupboard panels of mottled enamel, made a distinctive and exclusive finish to this 'tailor made' appliance.

The automatic features of Stott's boilers were appreciated by caterers, as they cut down consumption costs, and prevent damage to walls and ceilings by excessive steam. The No. 3 Magna water boiler with its large reserve storage capacity of boiling water, created wide interest, particularly the automatic gas control which reduces the gas supply as soon as the reserve of boiling water has been produced. Coffee was provided for the public from a Regulo café set incorporating the famous 'Regula' valve, and the 'Perco-Filtro' system of coffee making, and if there were any scepticisms with regard to this, they were quickly dispelled by the results obtained.

Among other items on view were a No. 1 automatic food steamer, a large two-pan 'Autofry' frying range and two 30 gal. vegetable boiling pans lined with stainless steel, all finished in enamel with chromium plated fittings.

During the exhibition a large manufacturing firm placed an order for a complete range of Stott's appliances with the prospect of at least one other contract in the near future. In addition, several other gas heated appliances were sold to hotels, canteens, and butchers.

Link Between Board and Consumers

North Thames Gas Consultative Council

THE North Thames Gas Consultative Council at its monthly meeting at St. Ermins Hotel on January 26 decided that a poster should be prepared setting out the names of all the members of the district committees, the districts represented, and the objects of the committees, and that copies should be displayed in post offices, libraries, and other public buildings, so that consumers should know exactly what steps they could take if, having complained to the local officials of the North Thames Gas Board, they were still not satisfied with their gas service.

The **Chairman** (Councillor E. Bayliss) announced that the four district committees had been established and had held inaugural meetings. The area was probably the first in the country to establish a complete organisation, the gas consultative council having been fortunate in having a smaller area than any of the others. He read the names of the Chairmen and Vice-Chairmen of the district committees and the council formally approved them.

The council had been in correspondence with the area board on the question of displaying the names of the district committees in the gas showrooms, and the board had urged that the names of only the district chairman and secretary should be displayed on the board's premises. While all members of district committees were to be encouraged to interest themselves in securing the best possible service to consumers, it would not be desirable for each individual member to negotiate complaints with the responsible divisional or district officer. The preferable procedure would be for members to submit complaints to the district committee who would, when necessary, pass them on to the consultative council. The full list of names would, however, be exhibited in public buildings and sent to local authorities, Members of Parliament, and the Press.

Arising out of an enquiry as to calorific values, a letter had been written to the area board stating that it would be helpful to the member who raised the question if a control chart for a period of a few weeks, showing the day to day limits of variation in calorific value could be supplied.

The board replied that the official charts were not in the possession of the board at any time, but went direct to the Ministry of Fuel and Power. It was suggested that the member might meet one of the board's technical officials for a discussion of the problem as affecting any case that he had in mind.

Refrigerators

At the previous meeting the council had received a statement from the area board that there were 15,000 prospective purchasers of refrigerators on the waiting list. Enquiry was subsequently made by the council as to whether the board felt it could take any action to ensure that refrigerators were installed in new municipal dwellings only for those tenants who intended to use them. It was thought that if the board refrained from canvassing municipal authorities and the choice of a refrigerator was left to each individual tenant a larger number of appliances would possibly become available to meet the unsatisfied demands of gas consumers in other types of dwelling.

The board's reply was that the matter would appear to be one for the housing authorities. The refrigerator manufacturers canvassed them and the board had no control over that activity. It was added, however, that a reduction in the number of refrigerators supplied to local authorities for housing purposes would be unlikely to make more available for the general public, because, according to information received by the board from the makers, the allocation of steel for their manufacture, which had been drastically cut for the year 1950, was made only on the understanding that it was used for that particular type of refrigerator.

It was agreed to try to ascertain whether the available steel was apportioned fairly as between gas and electrically-operated refrigerators.

Gas Fires

Comment had been made on the high price of space heating appliances and the council had asked why these were not available on hire-purchase terms. It was pointed out that in some cases gas was the only convenient form of space heating and the present lack of hire-purchase facilities gave an unfair advantage to those able to buy outright and bore hardly on less wealthy consumers whose need was often just as great.

The area board's reply was that space heating appliances were subject to a purchase tax of 66⅔% which was imposed to limit their sale because at a time when both the gas and electricity industries were short of manufacturing plant the heating load could be embarrassing in cold weather. It was therefore considered that to encourage the sale of space heating appliances by offering hire-purchase terms at the present time would be contrary to national policy. On the other hand, gas-ignited coke grates were not subject to purchase tax and were supplied by the board on deferred payment terms on application.

Low Pressures

Complaints of low gas pressures on Sundays in parts of Walthamstow and Finchley had been passed on to the area board with a request for investigation with a view to seeing whether any improvement was possible.

Regarding Walthamstow, it was replied that work started just over a year ago on the laying of a 24 in. main from the Lea Bridge works to the junction of Forest Road and Blackhorse Lane, and that when this was brought into use in the next few weeks it was hoped that pressures would be improved. In the case of Finchley the board had no evidence that the pressures in the neighbourhood concerned were anything but satisfactory. Complaints of poor supply might be due to a number of causes such as unsatisfactory adjustment of appliances, inadequate size or partial blockage of internal piping or service pipes, or inadequate pressure in the mains. In the case in question apparently the complaint related to the installation in a particular house.

The council had suggested to the area board that it would be helpful to members of district committees and enable them to get a better picture of gas supply conditions in their districts if they could be supplied with information regarding the number of consumers and the amount of gas consumed quarterly or annually in the domestic, government and municipal, industry and manufacture, and commerce (offices, shops, &c.) categories.

The board regretted that statistics were not available in the form requested, and to provide them would not be possible with the existing staff.

Rural Problem

The question of gas supplies to the area of the Cookham (Berks) Rural District Council had been raised at the previous meeting. The area board reported that it was not yet in a position to give information on the question, which was an important one of policy. Several people lived a long way from the existing mains, and the provision of the long lengths of main involved was expected to prove uneconomic. The board had carefully to consider whether or not it should subsidise such unremunerative expenditure from the point of view of long-term development.

The **Chairman** said the board's chief officers were preparing a report on the whole question, and he hoped to report further at a later date. He thought it was questionable, from the point of view of national economy, whether it would be right for the board to lock up many thousands of pounds in mains which would probably not carry a profitable load for the next 20 years.

Some gas showrooms keep open on the local early closing day and close on Saturday afternoons and others adhere to the early closing day. A request was submitted from Willesden and Harlesden for the showrooms to remain open on Saturdays, when shopping was at its height, and this was passed on to the board.

A final question related to by-products. The Chairman said that as far as he knew the board was continuing the same policy as that practised for many years by the former Gas Light and Coke Company.

Broom and Wade, Ltd.

Before taxation, net profits for the year ended September 30 last amounted to £305,631, compared with £259,867 for the previous year. A final Ordinary dividend of 15% makes 22½% for the year, the same as for the previous year.

Major Developments in the Northern Area

Close Co-operation Envisaged with the N.C.B.

THE Northern Gas Board has issued a statement, at present under consideration by the Northern Gas Consultative Council, giving details of approved major developments for the extension and improvement of gas supplies within its area. An analysis of these plans, which affect all the 10 divisions within the area of the board, shows that new carbonising and ancillary plant under construction or to be installed in the next few years will have a total capacity of over 20 mill. cu.ft. per day, together with an additional 9½ mill. cu.ft. per day to be provided by new water gas plant. Additional reconstruction and extensions are envisaged for a number of undertakings, including the erection of at least eight gasholders with a total capacity of 16 mill. cu.ft., schemes for further integration, and an expansion of existing grids. The following information from the report provides a more detailed picture of the board's projects for each of its divisions.

Heavy Arrears at Newcastle

The demand for gas in the Newcastle Division, which with its 271,000 consumers is the largest unit, continues to increase and is now approaching twice the pre-war level. The limitation of constructional work in the war years with its legacy of heavy arrears and the slow execution of contracts under present conditions has led to a situation in which, says the report, 'difficulty in meeting all winter demands may continue to be experienced for a further year or two.' Planning, the board adds, is complicated in this as in several other divisions, by the requirement of the Gas Act that it shall be done in consultation with the National Coal Board, and related to the carbonising (coke oven) developments of that Board.

Development plans are in hand for all the five works within the division, with the exception of that at South Shields, which it is hoped will eventually be abandoned as a manufacturing station following complete reconstruction at the Howdon works. The Howdon scheme, which will increase the capacity of the works from three to eight mill. cu.ft. per day, with an additional four mill. cu.ft. per day from new water gas plant, has as its main feature a carbonising plant (chamber ovens) to treat 550 tons of coal per day. Coal blending and storage plant, coke screening and grading plant of appropriate capacity will be included in this project, which will be completed in the middle of 1952 at an approximate cost of £1½ mill. As an integral part of the work two 12 in. high pressure mains will be laid in the Tyne tunnels linking Howdon with Jarrow, where a new 3 mill. cu.ft. gasholder is to be built. This linkage of the two works will greatly assist in distribution problems, and will facilitate the abandonment of South Shields as mentioned above.

Constructional work at the other divisional stations include the completion by this autumn of additional water gas plant at Redheugh, with a capacity of 4 mill. cu.ft. per day, the erection of a 3 mill. cu.ft. gasholder at Elswick, new distribution mains and an experimental liquid purification plant, ready for test this summer, at North Shields.

Sunderland's Link with N.C.B.

The building of a new town at Peterlee with concurrent developments in the adjacent area have added to the problem at Sunderland, where demand has also developed ahead of plant construction. Here the principal development will be a new carbonising and ancillary plant, with a capacity of 3 mill. cu.ft. per day, for which contracts have been placed, and a 2½ mill. cu.ft. gasholder at Hendon to be completed early in 1953. The board is waiting for definite news from the National Coal Board concerning the possible construction of a large coke oven installation at Fence Houses. If this proceeds, the board states that 'the situation at Sunderland will be relieved for a long period of years; failing this it will be necessary to construct a new gasworks similar to the reconstruction at Howdon at a point from which both Sunderland and South Shields can be supplied, with connections into the Tyne tunnel mains.'

A further link-up between the division and the N.C.B. is planned for the undertakings at Chester-le-Street, Stanley, Annfield Plain, and Shotley Bridge, which will be linked together and supplied from the coke ovens at Stella Gill, Pelton, subject to satisfactory assurances as to their future and the provision of essential purification and compressing plant. The Durham works are already supplied from Stella Gill, but a project is under examination to link them to the Brancepeth, Willington, ovens of the N.C.B. also, as an insurance against failure of supply and to join together two local gas grids.

Supply Problems at Middlesbrough

The future of supplies is uncertain at the Middlesbrough works. The main source of supply here, as at the Redcar works, is derived from Dorman Long's coke ovens, the contract for which expires in 1955 and will not be renewed. If a N.C.B. plant at Fishburn proceeds without undue delay it will provide an alternative source which would also enable certain smaller works in the division to close down. Failing this, the board will be compelled to build a plant of comparable size.

Meanwhile, mainlaying work is going ahead to link Middlesbrough South Bank, Wilton, Skelton trading estate, Redcar, Skinning Grove, and Guisbrough into a grid system. Other measures include the completion by this summer of a duplicate of the existing Tully plant at South Bank, a ½ mill. cu.ft. per day carbonising plant at Cleveland, and a 1 mill. cu.ft. capacity water gas plant at Redcar, both of which will be in operation by the middle of 1951.

In the Blyth Division increasing requirements at Blyth and the Bedlington area will be met by the construction at the Blyth works of additional vertical retorts to increase production by 1 mill. cu.ft. per day. When this extension is completed in the spring of next year it will also be possible with a bulk supply of gas from Newcastle, already connected to Morpeth, to open up the Ashington-Newbiggin area. Extensive reconstruction is anticipated at the Berwick works, and a short-term project for Alnwick is being examined, pending a radical re-planning of the whole division which may lead to the utlimate abandonment of the Alnwick works.

Enlarged Grid System

The Workington division proposes to increase the volume of coke oven gas which it now purchases from the Workington Iron and Steel Company. This will be used to extend the existing grid from Workington to Ennerdale, to feed Whitehaven and possibly Seascale to the south, and Maryport, Aspatria, Cockermouth, and possibly Silloth to the north, with a branch to Wigton. Alternatively, a works on a new site at Workington will be built to supply the whole area. New gasholders are planned for Workington, Cockermouth, and the Ennerdale area.

In the remaining four divisions, extensions to carbonising plant are to be made at the Darlington, Stockton, and Carlisle works; no major scheme is in hand for the Penrith division. At Darlington mainlaying is going ahead to take a supply from the Evenwood coke ovens of the N.C.B., from which a branch will be taken to Barnard Castle and adjacent camps. A 2½ mill. cu.ft. per day water gas plant will be completed in a year's time, and additions to carbonising plant, ½ mill. cu.ft. per day capacity, will shortly be in operation. The Stockton works hopes to complete half of a new 4 mill. cu.ft. per day carbonising plant in September, 1951, and the second half in June, 1952, together with coke screening and ancillary plant. A site is being sought for a 3 mill. cu.ft. gasholder. A similar development is taking place at the Carlisle undertaking, where carbonising plant which will supply 1,600,000 cu.ft. per day will be completed in June.

The Barry Undertaking of the Wales Gas Board was associated with Alfred Bird & Sons Ltd., of Birmingham in a very successful week of cookery demonstrations in the Barry Memorial Hall last month. Introduced by Mr. S. D. Coole, Engineer and Manager, the Mayoress performed the opening ceremony and congratulated the promoters on their enterprise in providing local housewives with an opportunity of adopting new ideas and suggestions in food preparation. Mrs. Mair Jones, Domestic Science Organiser (Alfred Bird & Sons) responded. Miss E. Gould, Home Service Advisor, Barry, presented the Mayoress with a bouquet. Attendances were excellent throughout the week, the morning sessions being devoted entirely to schoolchildren.

Gas Price Revisions in the South Western Area

Increases in 68 Districts

FACED with an expenditure of £6 mill. on replacing plant and an increase of £100,000 in the cost of coal, the South Western Gas Board announced on February 3 that it would have to raise the price of gas in 68 districts. The new prices are to come into operation from February 13. Price increases were announced by the board last July, but it was reported in November that the notices had been withdrawn after Mr. I. J. Pitman, M.P. for Bath, had raised legal points on the alleged lack of detailed public information on the tariffs. Formal announcement of the new revisions was made in south western newspapers on Friday.

Mr. **C. H. Chester,** Chairman of the board, issued a statement in which he gave an outline of the board's policy in regard to prices and tariffs, the details of which had all been carefully considered at several meetings of the gas consultative council and the area board. While the board regretted the necessity to increase prices, it had no alternative but to do so if it was to meet its obligations under the Gas Act, 1948, to pay its way taking one year with another. The new prices would, in fact, as nearly as could be calculated, only just meet outgoings in a full year, based on the costs when it took over on May 1, 1949, plus an additional £100,000, due to the increases in the cost of coal on May 30.

Among the undertakings transferred to the board on vesting day were some which immediately before that date were running at a loss or were having recourse to reserves. It was the duty of the board to rectify that position. There was also the necessity to replace manufacturing and distribution plant necessarily delayed since 1939 due to the war, and in succeeding years when material and labour were exceedingly short. This plant was only now being delivered on orders placed some two years ago. The result of this was that the board was at present faced with an expenditure of over £6 mill. on replacing and enlarging plant and mains at costs of anything up to four times the 1938 prices. While some of the previous owners had made adequate provision for this expense, unfortunately many had not, and the liability which would inevitably have had to be met must now be accepted by the board. Every step, however, would be taken to keep the cost to the barest possible minimum. These, in addition to the increase in the cost of coal, were the major reasons for the necessity for increases in the price of gas.

System of Charging

For reasons stated in the advertisements, the price of gas had been increased in varying amounts in 68 districts and had been reduced in 36 districts, in many of which the cost of gas to the consumer was considered to be abnormally high and not competitive with other fuels.

There had been an effort to simplify the system of charging, and the board proposed further to investigate the whole system as soon as it conveniently could, but, owing to the wide variations in the existing price structure throughout the area, it was impossible to forecast the day when a further simplification of charges would be possible. At the present time the board's managerial and accounting staff were investigating the possibility of introducing at an early date a uniform two-part tariff or block rate system of charge which would be sufficiently attractive to encourage consumers to extend their use of gas appliances.

Further increases in costs, outside the board's control, were foreshadowed, and these were serious blows to its planned economy of operation. He referred to transport charges and to the increased cost of gas oil which would result from devaluation. If the 16⅔% increase in the cost of rail charges was granted to the Railway Executive, this, together with the increased cost of gas oil, would amount to at least £250,000 increased costs, which would, unfortunately, more than offset the economies in operation which the board had already effected.

As a practical gas engineer, his first duty on taking up his appointment on January 1, 1949, and since, had been to investigate with his technical officers the whole of the production of gas in the south-west, and a great deal of work had been accomplished. They had in mind reductions in the cost of gas production and they knew that they could save a very large sum on better methods of gas making as soon as they could get all the new plant now on order, most of which was ordered prior to vesting date.

Savings on Coal Costs

They had already saved nearly £30,000 per annum in the reorganisation of coal deliveries and overhead costs of management were no more than they were prior to nationalisation. Integration plans would make it possible to close down a number of small manufacturing units during the next year or two, after which, provided they could obtain the necessary pipes, several others would be similarly closed. This was involving all the staff in a terrific amount of work, which they were tackling with great and commendable energy, but in response to the Prime Minister's appeal for economy, they were necessarily concentrating on vital schemes which would give the best results and ensure an efficient supply of gas. Over 60 areas in which the supply of gas was deficient had been carefully investigated and steps taken to improve the supply as soon as they could get the necessary supply of pipes, but every scheme considered underwent a strict test of economy and service.

They knew from many letters already received from consumers throughout the area that the improved service they were giving by clearing and replacing old mains and improving the quality of gas was being appreciated. This applied particularly in the areas of supply of small undertakings. Towards the end of 1949 hire-purchase was made available to all consumers at uniform rates throughout the area and recent sales figures for gas cookers and water heaters showed that this policy met the very real need of gas consumers generally.

Coke Marketing

They were confident that with increasing demands for gas and modern appliances, the consumers' requirements would be met at as low a price as gas could possibly be made and sold, and it was the board's firm intention eventually to give the same service to consumers in rural areas as in urban areas at the cheapest possible price. In order that consumers might see the most efficient appliances, additional showrooms and service centres had been opened and a travelling showroom, which was now on tour, had been purchased. They were also tackling energetically the marketing of coke by installing plant for the production of properly graded fuel which would ultimately be available throughout the whole of the area.

'Our policy,' concluded Mr. Chester, 'is devoted to bringing our works and distribution systems up to a high state of efficiency, which will inevitably reduce costs, and thereby encourage an increased, though more economical, use of gas and coke. The gas consultative council, whose Chairman is an *ex officio* member of the board, is a very live custodian of the consumers' interests, and we are taking all steps to keep them fully informed of our policy, projects, and gas prices.'

Yorkshire Juniors

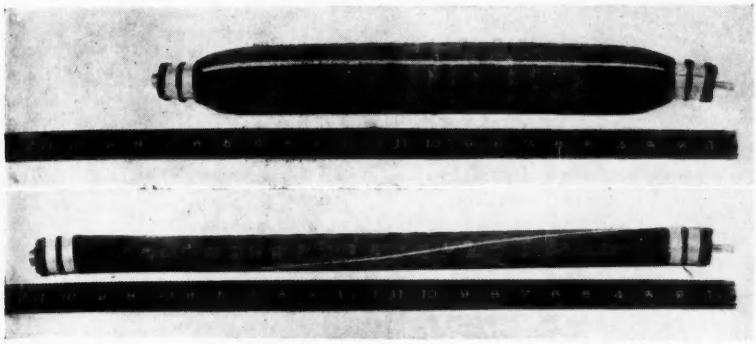
Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, addressing a meeting of the Yorkshire Junior Gas Association, in Leeds, on January 21, said there were more opportunities under nationalisation, not less, for the man who really got down to the job. There were really big changes in technology round the corner, and they must take full advantage of these scientific discoveries as they came along. It was up to the Juniors to find the specialists, said Dr. Edwards, and then by mutual understanding and research, provide the industry with the specialists it needed.

Mr. J. Hoskin, Leeds, read a paper on 'Present-Day Distribution Problems,' a summary of which appears on pages 339-341 of this issue.

The Trade Statistics for December, 1949, just issued by the Central Statistics Office in the Republic of Ireland, show imports of 16,358 tons of gas coal, valued at £80,045, as against 15,513 tons, valued at £68,796 in December, 1948. This brings the total of these imports for 1949 to 243,962 tons, valued at £1,103,542 compared with £23,404 tons valued at £996,985 for 1948.

AN AID TO MAIN AND SERVICE LAYING

Last week we attended a demonstration at the works of Wiggins-Sankey, Ltd., Fulham, of a method of forming moulded ducts which will prove of direct interest to the gas industry in facilitating main and service laying. The principle depends on an inflatable rubber tube—'Ductube'—which can be used for moulding ducts up to 3 in. diameter in any type of concrete, whether aerated, reinforced, plain, or vibrated. It can be used in straight runs, in continuous or reverse curves, and will free itself at once from the concrete as soon as it is deflated. It has proved its worth in America and Australia.



Our photograph shows (top) 'Ductube' inflated and (bottom) after deflation

It is inflated to the size required (50 to 70 lb. pressure required, and air should be oil free) laid in the mould or shuttering, tied as required, and the concrete poured. When the concrete has set the tube is deflated and frees itself at once; it can then be pulled out and is immediately available for re-use.

The basis of the 'Ductube' patent is the diagonally braided fabric core of the tube, which is similar in principle to the braided sleeves which electricians use for pulling cables into conduit. When tension is applied the sleeves contract as they lengthen, and thus grip the wires. Conversely, in 'Ductube,' when the diameter increases as the tube is inflated the core contracts lengthways, so that the length of the tube decreases uniformly by about 15%. Also, since one set of the diamond fibres in the fabric core is braided with a slightly greater tension, there is also produced a twisting movement over the whole length of the tube.

There are, therefore, three distinct movements by which the key between concrete and tube is broken as soon as the tube is deflated. First the decrease in diameter, second the increase in length, and finally the twist. In the unlikely event of a tube binding in a long curved duct re-inflation and subsequent deflation will always produce further movement and free the tube.

'Ductubes' are made of high quality rubber and will resist the maltreatment which is almost inevitable in concrete work. Although no definite figure can be guaranteed 'Ductubes' have been used in other countries for several hundreds of mouldings and still remained serviceable. Elementary precautions, the avoidance of oil and excessive exposure to sunlight, will naturally help to provide longer service.

'Ductubes' are made in lengths of 60 ft. and in four diameters, to produce finished ducts of 1, 1½, 2, and 3 in. diameter. Owing to the shortening produced by inflation a 60 ft. length of tube becomes a working length of 50 ft., but longer runs can be made by joining two lengths of tube.

If ducts larger than 3 in. diameter are required they may be produced by tying tubes together and using them as a single unit—*e.g.*, a duct 9 in. by 6 in. is produced by using six 3 in. 'Ductubes.'

The inflation valve is the ordinary Schrader car type so that replacements are easily available everywhere.

Total Production of coal in the week ended January 28 at 4,377,800 tons was 47,200 tons lower than in the previous week, but 79,500 tons better than the same week's output last year. During the week ended January 21, 600 men left the pits, all of them workers at the face, reducing the total number employed to 708,200, the lowest level since the beginning of 1947. Gas available at gasworks in the week ended January 27 increased from 11,742.9 mill. cu.ft. to 12,704.3 mill. cu.ft., while electricity supplies also went up over the same period from 1,085.9 mill. units to 1,184.1 mill. units.

Birmingham's New Record

The Birmingham District of the West Midlands Gas Board (formerly the City of Birmingham Gas Department) has added a new record to its past accomplishments by sending out in a single day more than 100 mill. cu.ft. of gas. This was achieved on January 26, when the output was 101,487,000 cu.ft.

During the same week the previous daily record of 96,576,000 cu.ft., which was reached as recently as December 12, was exceeded on no fewer than four occasions, the week up to January 28 ending with a new weekly record of 631,677,000 cu.ft. It was, in fact, a week of records—Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday all being the highest outputs ever achieved.

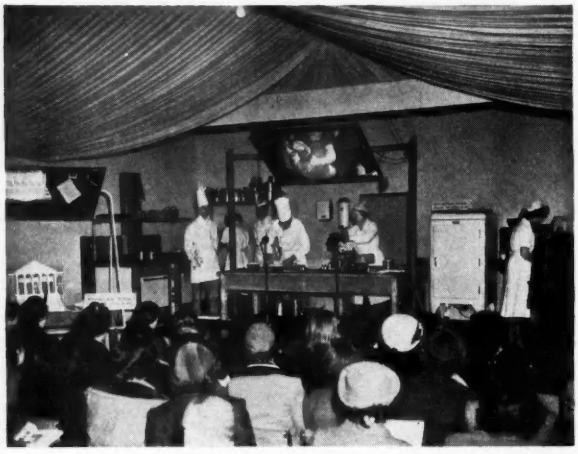
The undertaking justifiably views with pride figures of these dimensions. Some idea of their magnitude is best gained by comparison with the output of other undertakings, and it is interesting to note that Birmingham's weekly figure approximates the annual output of undertakings like Margate, Folkestone, Lancaster, and Widnes.

The spirit of progress which has always marked Birmingham's path is more than ever present in the undertaking under its new ownership.

Members of the Association of Civic Heads have for some time shown keen interest in the production of appliances, visiting various towns in the area covered by the Association. On January 26 members of the Association visited the works of Cannon Iron Foundries, Ltd., Bilston. After being received by the Chairman and Managing Director, Mr. A. F. Oatley, the party formed into various groups, and made a tour of inspection. Admiration was expressed of the many processes and of the general organisation. Our picture shows molten iron being poured into the moulds.

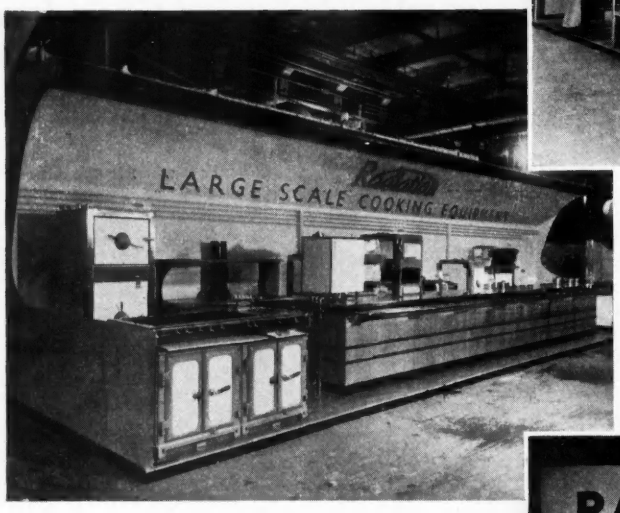
Pictures from

Outstanding Features in



Left : *Students of the South West Essex Technical College, Walthamstow, with Mr. Shaxon, the Chief Instructor, and Miss Alice Stedman, Senior Lecturer, at work in the exhibition's demonstration kitchen. Laid out by the North Thames Gas Board, this fine kitchen included equipment loaned by the Gas Council, Benham & Sons, Ltd., Parkinson Stove Co., Ltd., Electrolux, Ltd., and De La Rue, Ltd. (Potterton Gas Division).*

Right : *The large stand of Benham & Sons, Ltd., which displayed a wide range of catering equipment. One of the most notable features was a new deep fat fryer unit, the Mk. III, which has heat exchanger tubes or flues near the bottom of the pan through which the combustion products pass, the heat being transferred to the oil.*



Left : *The stand of Radiation (Large Cooking Equipment), Ltd. Their new pressure steaming oven, illustrated in last week's* JOURNAL, *is on the extreme left of the picture, and a good impression can be obtained of the handsome 24 ft. service counter which fronted the stand.*

Right : *The Radiant Heating, Ltd., exhibit. Appliances shown on this stand were of two main types—space heaters and catering equipment. The latter included the three infra-red appliances featured at the recent Building Centre demonstration, notably the salamander with its overfired grill and rapid heating up, the vertical grill which cooks both sides at once, and the thermostatically controlled bread toaster.*

Hotelympia

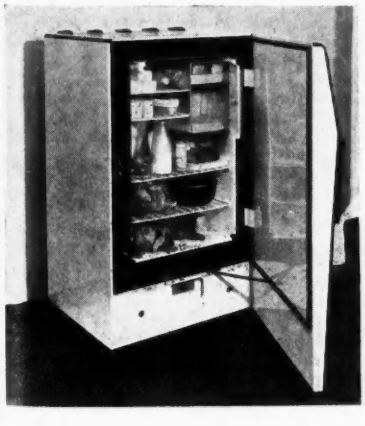
Display and Design

Right: *The large range of exhibits on the stand of G. F. E. Bartlett & Son (Metal Workers), Ltd. The centrepiece of the display was a snack bar counter, behind which was ranged the firm's café equipment. Another notable exhibit was a combination counter bain marie and pastry warming unit, which consists of an outer casing into which the vessel is fitted, covered by a fixed plate with apertures for containers.*

Left: *The stand of James Stott & Co. (Engineers), Ltd. Our photograph gives a good impression of the modern appearance of this stand which attracted particular attention because of the several new appliances featured. In particular mention might be made of the prototype cafeteria service counter, shown at the left, with hot cupboard, bain marie top, a refrigerator unit, and café set. Another new item was a non-pressure coffee percolator of American type, supplied in either circular or octagonal form. Other exhibits included hotcupboards, the 'Regula' range of patent water boilers and café sets, &c.*

A New Gas Refrigerator

We illustrate the new gas refrigerator manufactured by Gasel Appliances, Ltd., of Darlaston, Staffs. (London Office: Kent House, Market Place, Oxford Circus). Gasel Appliances is associated with the Owen Organisation and the directorate includes Mr. Leopold Friedman and Mr. B. H. Carson. This new model, Type 400, is the result of a great deal of experimental research and it has most attractive lines, the design being due to Mr. Grey Wornum, F.R.I.B.A. The cabinet is of steel finished in white vitreous enamel, and a feature is a 'trigger action' door lock which opens to the touch of a finger. The interior is finished in white porcelain enamel and 'flat wire' shelves permit clear air circulation space. Lighting is automatic and all automatic controls, including a specially designed thermostat, are readily accessible. It is an absorption machine and is consequently silent in operation; and it can be run on gas, electricity, or paraffin.



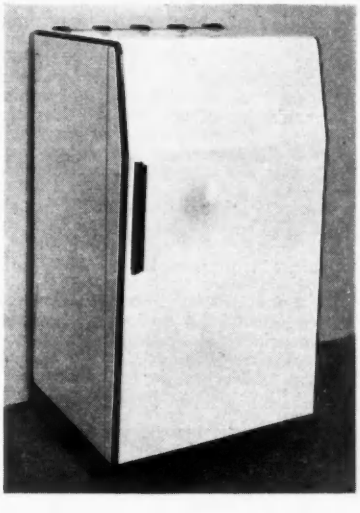
The capacity of the Gasel Type 400 is 4 cu.ft. and we give the following relevant data:—

Cabinet volume, net ...	4.09 cu.ft.
Frozen food locker ...	0.215 cu.ft.
Shelf area	8.04 sq. ft.
Weight of ice: 2 trays ...	2.7 lb.
Weight of ice: 4 trays ...	5.4 lb.

Cabinet dimensions:

	in.
Overall height	51
Overall depth	28
Overall width	28

This new refrigerator has been subjected to the most stringent tests before being placed on the market and it is, we feel, assured of wide acceptance.



Gas in France

By Our Own Correspondent

INTRODUCING a lengthy abstract of Mr. Hendee's Communication to the International Gas Union on American methods of dealing with peak loads, M. Ch. Tixier, in the December issue of the *Journal des Usines à Gaz*, reviews the position as seen in France. He notes that the attention of the gas engineer in all countries is turned towards means of gas production other than that of the distillation of coal to meet peak demands, very generally towards the utilisation of petroleum products, distributed direct where possible in the gaseous state, otherwise cracked by heat or converted by reaction with steam. In France complete gasification of non-coking coals may furnish a solution to the problem. At bottom the problem is that of the cost of production. Gas produced to cover the peak demand must not be excessively more costly than coal gas, taking account not only of the cost of the raw materials but also capital charges for the plant to be installed. America has at her disposal means, material and financial, very different from those of France. American policy in this matter is based on the employment of petroleum products, natural gas, propane, butane, petrol, and other oils. French fiscal policy and the policy of sales of natural gas in the South-West do not permit of so intensive a utilisation of petrol products as in the country of Mr. Hendee.

Phosphatation

M. A. Marty, Chief of the Tar Section of the Research Department of Gaz de France, contributes a lengthy survey of the technique of the preparation of metallic surfaces for the application of anti-rust paints. A new development appears to be that of 'phosphatation' in which the surfaces are washed with a carefully selected concentration of phosphoric acid. The object is to form an intermediate layer of microscopic crystals of phosphate of iron between the metal and the layer of paint afterwards applied. It has been observed that paints applied with this treatment have a quite exceptionally long life. The surface is first brushed down. A slight rust, neither scaling nor dusty, constitutes the best support for the phosphate. 'The reaction is immediate, the metal whitens at the clean spots and blackens on the rust. Once it is dry the metal is out of danger and if the paint, always necessary and which is not replaced by phosphatation, is applied within one to eight days, there is the certainty of having realised the famous complex which is the best opposition to the (electrochemical) Evans effects.' Good paint, well applied to a surface well prepared, will always give good results.

Co-ordination of Gas and Electricity

News items include the composition of the committee which has been set up for the co-ordination of gas and electricity. The principal object of the committee is to establish a gas and electricity policy in the general interest to make the most of the national energy resources. To fulfil its object the committee will, notably, have to define suitable methods of analysing prevailing prices, to examine, with a view to the harmonisation of the selling prices of electricity and gas, the make-up of these prices starting from costs, and to propose to the directors of the two industries measures which appear to favour the harmonious developments of the sales of electricity and gas.

Natural gas has been discovered in French Tunisia and successful borings made. The gas, after extracting 10% air, shows approximately the composition, 80% methane, 10.1% ethane, 5% propane, 1.6% butane, 1.8% superior homologues. Systematic survey is in progress.

A demonstration plant for the gasification of pulverised combustibles is in course of construction at Rouen by the Compagnie Générale de Construction de Fours. The process is known as 'Panindco,' a development of the Schmalfeldt process which has been in industrial use at Lützendorf for about 10 years. In spite of much research and many trials of more recent date in Germany and the United States with other processes for the gasification of pulverised fuels, none has as yet reached the stage of an experimental approach to industrial application. This attempt to utilise the experience gained at Lützendorf and to realise in France an improved installation based on information drawn from the industrial working of the original Schmalfeldt process for a number of years is of great interest. The Rouen plant, which is of a capacity from 250 to 500 kg. (say, 5 to 10 cwt.) per hour, will permit the production of gas for the synthesis of ammonia or methanol or fuel oil. The gas produced will also serve for the production of hydrogen by conversion of the oxide of carbon. It is expected to be in operation early in 1950.

Coal Supplies

The coal industry is engaged on the programme of coal supplies for 1950. At the beginning of November the industry proposed to the Minister of Industry and Commerce the reduction to the limit of importation and the suppression of the subvention accorded to imported coals to bring prices into line with those of French coals. The negotiations appear to have resulted in a programme which while limiting importation, takes account as far as ever possible of the wishes and needs of consumers while assuring on acceptable terms the placing of the national product.

The new programme makes an annual provision for the gas industry of 5,100,000 tonnes of which 1 mill. will be imported, mostly from the Ruhr and from Poland with which the French Government has a contract which will not terminate until 1952, and finally a small tonnage from Great Britain. For the moment no American coal is allocated to the gas industry for 1950. There is no precise news as yet about prices. New scales are under discussion. It seems that they will tend towards a diminution of the differences between prices of screened coals and those of fines and to the adoption of zonal adjustments which will permit coals from the Saar and Lorraine to arrive at distant consumers at acceptable prices.

TAXATION AND ENTERPRISE

Addressing members of the Federation of British Industries in Leeds, on January 26, Sir Robert Sinclair, President, said that in relation to turnover gross profits are not in excess of pre-war standard and that, after meeting the exhausting drain of present taxation, the net profits that remain are inadequate to meet the urgent demands which must be met from them. As a result industry is forced in part to live upon capital—and that is unhealthy. This gradual exhaustion of industrial capital is one of the most serious impediments to economic recovery and is a trend which not only must be checked but must be reversed, if British industry is to achieve the increase in production universally agreed to be necessary to enable the country to stand on its own feet again.

The cure lies not in palliatives but in the isolation and elimination of the virus at the root of the disease. Direct taxation alone absorbs anything between 50% and 58% of all profit earned. Serious as this is in itself, it becomes doubly serious when the profits assessed to tax are so calculated as to include what is, in an economic sense, an element of capital. As a result of the decline in the value of money in the last decade the amount of money required both to finance a constant volume of production and to replace the exhaustion of stocks, plant, and machinery has correspondingly increased.

Owing to the heavy weight of income tax and profits tax on industrial profits, the 'fruits of enterprise' are sadly dehydrated by the time they are received and correspondingly the incentive to make risk-bearing investments is greatly reduced. If this situation continues industry may be forced increasingly to a method of finance which involves a guaranteed fixed return on the investment, and should unfortunately recession and depression again come, a possibility which cannot be ignored, the strength and resistance of the companies concerned and their ability to weather the lean years will be seriously impaired. The true remedy must lie in a reduction in direct taxation and, in particular, a remission of existing rates of tax on sums put to reserve.

Government expenditure must be substantially reduced and national income must be substantially increased. What the situation needs today is not merely that quality of endurance which the people of this country on occasion have so magnificently displayed, but also and still more the spirit of enterprise which was and still must be the true foundation of our greatness.

Gas Research in France

***EDITOR'S NOTE*:—The following is an abstract translation by Our Own Correspondent of an article by M. A. Gouffé, Chief of the Physics Section of Gas Research de France, which appeared in *Chimie et Industrie*, December, 1949.**

ALL the physics laboratories for gas research are of relatively recent origin. The laboratory for testing gas appliances of Gaz de Paris, now at 44, rue Amelot, was originally set up in 1913 in the Faubourg Saint-Denis. The laboratory for distribution services of the same company in the rue d'Aubervilliers was not in operation until just after the 1914-18 war and it was only in 1922 that it was transformed into a laboratory for physics research. As for the physics research laboratory of Sté. d'Eclairage, Chauffage et Force Motrice, still the most recent institution, the first instalment set up at the Gennevilliers gasworks dates from 1929. Why this tardy development of physics research, when immediately after the war of 1870 Emile Sainte-Claire Deville was already manipulating his testing apparatus at the works of La Villette?

It was really the development of the electrical industry and the laying in the sub-soil of Paris of the underground network of continuous current conductors which led the Cie Parisienne du Gaz to set up, in 1893, its first electricity laboratory to study the means of defence of its gas mains against electrolysis whose misdeeds were beginning to be apparent. This modest laboratory in the rue Pétrelle was fitted, soon after the Exhibition of 1900 where the first high-pressure lamps were shown, with a dark room for the study of these new sources of light. And thus appeared the first embryo of the physics laboratory for gas research. On the eve of the 1914 war the dark room and electricity laboratory were transferred, with considerable enlargement, to the rue d'Aubervilliers to form the laboratory for the distribution services—later the Laboratory for Physics Research—of the Sté du Gaz de Paris.

Era of True Coal Gas

Up to this time the gas companies had scarcely begun to concern themselves with the performance of gas utilisation appliances. It was the happy and easy era of the true 'coal gas' whose average composition remained pretty constant and whose physical properties (density, calorific value, combustion characteristics) presented, therefore, only insignificant variations. Gas appliances, the prototypes of which were controlled by the newly established test laboratory in the Faubourg Saint-Denis, if they had been well designed by the manufacturers, gave almost unlimited satisfaction to the consumers.

But in the years which followed the war of 1914-18 the increased demands of private consumers, in the happy atmosphere of the return of peace, added to the industrial needs considerably developed in the course of the hostilities, obliged the gas companies to put into operation new methods of production to satisfy, notably, the daily peaks of demand, as well as the heavy loads of the coldest periods in the winter. Thus appeared towards 1921-22 the first installations of water gas. It was soon clear that the mixed gas obtained by the addition of water gas to coal gas possessed combustion characteristics different from those of the old gas and that it would be necessary to take precautions before the one was substituted for the other. On the first evening of 1922 when mixed gas at 4,500 calories was fed to the Parisian system of lighting with pressure gas, numerous lamps were found damaged by taking fire at the injector with fusion of the burners and breaking of mantles. A study of the behaviour of mixed gas in its application to lighting, as well as to heating, became a matter of urgency.

From that moment the necessity was apparent to the bigger gas companies for laboratories specialising in the study of the possible repercussions in the several fields of application of changes in the processes of manufacture and, more generally, for all the researches affecting the distribution of gas and the development and improvement of gas-using appliances.

Existing Gas-Physics Laboratories

It is naturally the gas companies of the Parisian region which alone have been able to put forward the financial effort necessary to the establishment and maintenance of modern laboratories. The principal of these are described in the chronological order of their creation:

(1) The Test Laboratory for Gas Appliances of Gaz de Paris, 44, rue Amelot, directed by M. Duchêne with laboratories on three floors, a conference room in the basement and stores in the attics, includes also an annexe situated at La Villette gasworks with a large bay with travelling overhead crane, a 100 m³ gas meter and a workshop with machine tools. This annexe, which has a supply of electricity, serves for semi-industrial trials as required.

The work undertaken by the laboratory includes:—

Advice to constructors of new gas appliances and the examination of their prototypes.

Prescribed tests of domestic appliances for which is sought the official stamp of quality instituted by the Association Technique de l'Industrie du Gaz en France. The laboratory also puts forward its own prototypes of apparatus to meet new requirements.

To keep in touch with new appliances developed abroad and to take any possible advantage of them.

To pay systematic visits to industrial establishments and to inform consumers of possible improvements in efficiency or working conditions.

To collaborate with industrialists in regard to the application of gas to solve problems in which they are interested.

To give practical instruction to personnel who are to enter into contact with the public whether as instructors or prospectors.

(2) The Physics Research Laboratory of Gaz de Paris at La Villette gasworks occupies the ground floor of a building 43 m × 15 m and several annexes. It is provided with five gas meters with capacities stepped from 1 to 50 m³ to enable any desired mixture of gases to be made and to store reserves of gas of known composition. A double run of interior piping at medium and low pressure facilitates the comparative study of two gases with different characteristics. There is a special installation for the study of outlet flues from gas heating installations (furnace with control apparatus, experimental chamber with metallic walls 12 m high and a pylon 20 m high for the erection of chimneys). It is also equipped with apparatus for electrical measurements as well as for photometry and spectro-photometry.

Varied Work

Under the direction of Professor Chappuis since 1922 the laboratory has not only done work in distribution, gas lighting, and research in existing and new applications of gas, but also very varied work in pure science. In 1934 at the death of Professor Chappuis, Professor Ribaud, of the chair of 'high temperatures' at the Sorbonne, succeeded him. His High Temperature Laboratory was installed on the first floor bringing with it a certain number of the research projects in that domain and serving for the practical work of the students following Professor Ribaud's courses. Though independent of one another the two laboratories pool their resources and the Gas Laboratory benefits from the precise methods of the

scientific laboratory in the standardisation of all the apparatus for physical measurement, as well as the results of the research students some of whose work touches the problems of the gas industry.

(3) The Physics Research Laboratory of the Sté d'Eclairage, Chauffage et Force Motrice, at the Gennevilliers gasworks, directed since its foundation in 1929 by M. Biard, is in the first place devoted to experiments on domestic appliances.

The addition in 1937 of a large test bay with benches for the study of radiators and water heaters, absorption circuits with a capacity of 100,000 Kcal/hour, a mobile blower, and a hearth in refractory brickwork for the examination of large burners, has permitted the extension of its researches into the industrial field, for which it is now specially equipped. The function of this laboratory is similar to that of the laboratory of Gaz de Paris. It has perfected certain experimental methods, such as that for the testing of radiators which formed the subject of M. Biard's communication to the Gas Congress of 1930. It should also be mentioned that this laboratory, as indeed that of Gaz de Paris, performs useful work in the training of distribution and sales engineers who make periodical visits to it.

(4) The Joint Gas and Electricity Company at Rheims has a laboratory where gas appliances are studied. This laboratory, directed by M. Deschamps, participated for a time in tests for the stamp of approval as third arbiter to decide between the two Parisian laboratories in case of disagreement. The standardisation of test methods has now rendered this intervention unnecessary.

Work Accomplished

Laboratory research is always long-term work of which it is generally difficult to follow the progress or to appreciate the results. Following is an attempt at a general view of the activities of the gas-physics laboratories. Commencing at the outlet from the works there is first the measurement of capacity of and loss of pressure in the distribution system. In regard to pipes of small diameter carrying gas at low pressure the two Parisian laboratories organised towards 1933, independently of one another, tests the results of which, in complete agreement, enabled useful corrections to be made in the tables then in use for the determination of the diameter of, notably, rising services.

For high pressure distribution, different formulas in use by gas engineers, each only valid over a limited range, gave often divergent results. It therefore appeared indispensable to proceed wherever possible with experimental determinations, in which the laboratories participated. At the same time the research workers have engaged in the task of perfecting and unifying the classic formulas, taking account of recent work on the viscosity and compressibility of gases and on the influence of roughness in the wall of the pipes.

The measurement of the velocity of gas in mains, principally when this does not exceed some decimetres per second, has occupied the attention of the laboratory engineers. Different methods have been tried to supplement the Pitot tube which is practically ineffective for velocities less than a half-metre per second. M. Laure has used the anemometer with a heated platinum wire forming one branch of a Wheatstone bridge in disequilibrium; this apparatus has the defect that it gives no indication of the direction of the gas flow, but on the other hand it permits of corrections taking account of the difference between the actual temperature of the gas and that at the moment of standardising the apparatus. M. Hubert Desprez at the La Villette laboratory, proposed an arrangement to overcome these difficulties, though with less simple manipulation. He used two electric thermo-couples in opposition, one wound for heating. Introduced into the gas stream, a constant temperature difference is maintained between the two couples, requiring in the heating coil a current which is the more intense as the gas velocity is the greater. This current furnishes the measure of the velocity. These methods are only applicable to clean gases, free from solid particles in suspension, particularly those of tar.

Another method is to introduce at one point in the system a 'puff' of gas with physical characteristics different from those of the gas in the system (hydrogen or carbon monoxide, for instance) and to measure the time which elapses before its presence is signalled at another point at a measured distance. M. Duchêne uses an interferometer constructed in his laboratory as a detector; M. Laure, a hot wire. This method can be used with dirty gas but its precision is impaired by the rapid diffusion of the signalling gas.

Professor Chappuis has studied, with the assistance of X-rays, the mechanism of the attack of vagabond electric currents in the sub-soil on the metal of buried mains. A new series of investigations recently initiated by Gaz de France and confided to M. Maurin has resulted in the development of the cathodic protection and arrangements for diverting the current.

Gas Metering

Gas metering at consumers' premises is another subject which has exercised the ingenuity of research workers in the physical laboratories. After the war the lack of meters of large capacity risked the loss of a particularly interesting clientèle, mostly industrial. The perfection at the Amelot Laboratory of the shunt meter was opportune. Today there are more than 1,000 installations equipped with this type of meter. The calibration of these meters requires precision meters themselves of large capacity. M. Biard has been able to verify the accuracy of these large meters by an increment method using a small capacity meter calibrated from a gasholder.

Improvement in gas burners and problems of gas combustion generally figure among the questions which have given rise to the greatest number of research operations in the several laboratories. At La Villette, studies of velocities of flame propagation were undertaken by the method of the 'blue cone,' a technique developed by Gaudry utilising a tuyère profiled to give a uniform speed of ejection and enabling the operator to trace in a few minutes the curve of velocities of propagation as a function of the richness of the combustible gas mixture. At Gennevilliers, P. Delbourg devoted his Doctorate thesis to a study of the velocities of flame propagation with gases in turbulent flow which is generally the case in industrial burners. He distinguished four principal quantities; the speed of flow, the fundamental speed of deflagration, the critical speed, and the blast speed; and was able to determine the laws of variation of these quantities with the composition and temperature of the combustible mixture and with the diameter of the tubes utilised. With this question is connected the construction of burners with refractories at the point of injection by Glachant and Fougeray at the Amelot Laboratory, while M. Biard at Gennevilliers has established a complete theory of gas burners. All this work enabled the several laboratories to study in advance the probable behaviour of burners with the new gases and notably to supply to industrial works, during the difficult period of coal shortage which preceded the Liberation, rapid information on the mixtures of gas of low calorific value to which appliances and apparatus could the most easily be accommodated.

Studies in Combustion

Studies in the combustion of gas at Professor Ribaud's laboratory have been specially directed to the calculation of flame temperatures and the influence on these of the dissociation of the products of combustion, as well as of the preheating of the combustible mixture; values of the 'apparent' specific heats of the flame constituents up to 2,500°C. have been fixed. At M. Biard's laboratory the rapid calculation of the quantity of heat-release has been the chief object. It has been sought to obviate the necessity for a complete analysis of the gas, replacing this by the determination of certain constants, notably total hydrogen, total carbon, for which simple experimental methods have been evolved. Gaudry, at La Villette, has also perfected a convenient arrangement for the measurement of total hydrogen.

Combustion with excess air gives results readily confirmed by experiment. Combustion with less than sufficient air is more delicate; the introduction of the constants of dissociation permit the calculation a priori of the composition

of the products of combustion. R. Prévôt has found experimentally that, in the practical furnace, this composition is sensibly independent of the temperatures within pretty large limits of variation of the latter. This observation has led this worker first to the study of the preparation of neutral gases for heat treatment processes and to explain their action, and more recently to show that town gas alone is capable of effecting the case-hardening of steel without the use, hitherto deemed indispensable, of hydrocarbons. This technique achieves deep hardening (1 to 1.5 mm. in 3 hours) without changing the appearance of the pieces treated and without the superficial deposit of carbon. The process, still in the laboratory stage, is now in course of trial on the industrial scale.

Special Forms of Combustion

Several special forms of combustion are under research in the laboratories. Submerged combustion, where heat exchange is effected direct between the products of combustion and a liquid to be heated, has given rise at Gennevilliers to the development of a burner and a theoretical study which have given precision to the application of this technique, already old but not so far used in France in spite of its possibilities of high efficiency.

At La Villette, M. Gouffé himself is engaged on the study of interstitial combustion (surface combustion) at the surface of a porous refractory mass through which is injected a combustible mixture of composition in the region of that of the theoretical mixture for maximum propagation velocity. This process permits the construction of high efficiency radiators particularly useful in the heating of uncovered spaces or large industrial shops. The study has led to the perfection of silent feeds to these radiators with gas compressed at 1,500 mm. water-pressure.

M. Duchêne has put forward a new method of radiant tube heating utilising the combustion of gas by slow diffusion with the air in tubes of iron and has applied it to a number of industrial and domestic appliances (room heating, bakers' ovens, driers, &c.

Other researches are concerned with gas lighting at low and medium pressures and with gases of different compositions, control of mantles, and lighting generally. Under the heading of combustion are the systematic visits of laboratory personnel to industrial establishments. These have led, among other things, to many transformations of central heating boilers from solid to gaseous fuel.

Evacuation of Combustion Products

One of the last problems which has engaged the attention of the physics laboratory is that of the evacuation of the products of combustion of gas, a problem which often entails considerable practical difficulties because of their high moisture content and the consequent condensation in the interior of outlet flues and chimneys. This condensation, always slightly acid, quickly gives rise to the corrosion of metallic flues and may filter through brickwork or porous earthenware, discolouring adjoining exterior surfaces. This question has been very completely studied at the Aubervilliers laboratory in a special installation erected by Professor Chappuis about 20 years ago. The mechanism of this condensation is now perfectly understood and indications can be given in each particular case of the arrangements best adapted to prevent or at least to minimise condensation. In this installation, too, investigations have been pursued for the last three years, at the request of the A.T.G. and under the auspices of the Ministry of Reconstruction and Town Planning, into offtake flues of minimum section with their consequent advantages of space saving in building design or reconstruction. At the same time in the same laboratory (also that of M. Biard) studies and tests are being made of arrangements to facilitate the evacuation of products of combustion (static ventilators, chimney stacks with atmospheric evacuators, anti-down-draught, &c.). Noted in passing is an ingenious anti-down-draught device by Jean Prévôt utilising the Falkental effect—an aerodynamic valve produced by a grill of half-round bars.

This enumeration is not by any means complete, but it is hoped that it will give an idea of the great variety of research undertaken by these gas-physical laboratories. Very often the laboratories have had to devise and make themselves their own measuring instruments or improve and adapt existing ones. Some of these are enumerated.

Finally, there is the fine work done on the initiative of Professor Chappuis, since 1927, in the compression of town gas for use in motor vehicles. The whole technical problem of compression to 150 and 200 atmospheres, the equipment of the vehicles (mixers, expansion valves, gauges, bottles), all the secondary difficulties (gumming, freezing), have been studied and successfully dealt with by M. Pignot at the Aubervilliers laboratory. And thanks to this work several thousands of large and small lorries have been used, during the war and the German occupation, despite the shortage of petrol, in a great part of the internal transport of the country.

In the field of pure science researches pursued during the last 10 years at this same laboratory, concurrently with other laboratories abroad, in the establishment of a fundamental standard of illumination, has contributed to the definition of the 'new candle' and its adoption by the different countries adhering to the International Conference on Weights and Measures. This unit of luminous intensity, inferior by about 2% to the old 'international candle,' has become legal in France from January 1, 1948.

Standardisation and Co-ordination

In the foregoing account of the activities of the great physics laboratories these activities may appear to have been without any general guiding plan to direct the work of research or to distribute the work between the different laboratories. It will have been noted that sometimes the same researches have been pursued simultaneously in two different laboratories. These observations are not without foundation, and it must be admitted that hitherto the laboratories have followed their own devices, sometimes in competition or even in rivalry one with the other, in any case without sufficient contact between them or with the gas industry. To this situation the recent nationalisation of the industry should bring the remedy. In August, 1947, a Directory of Studies of Research of Gaz de France was created and placed immediately under the authority of Professor Ribaud, who, by his past record as well as by the extent and quality of his scientific work, was the personality best qualified to occupy this important position. The first task of the new Directory will be to co-ordinate the activities of the several gas laboratories, both chemical and physical, and both technically and administratively.

As regards the physics laboratories especially their respective functions will be defined. They will form the Section of Utilisation and Distribution, and will include (1) a general physical laboratory (rue d'Aubervilliers), (2) an applied physics laboratory (rue Amelot), and (3) a laboratory of industial physics (Gennevilliers). Their respective functions are briefly outlined. They will establish and maintain close liaison with the manufacturing stations and with the services of distribution and sales.

The Directory of Studies and Research will fix the programme of new work to be undertaken, in accord with the Association Technique of the industry. It will also establish contact with the parallel electricity departments and with research organisations in related industries—coal, steel, chemical, &c. The Directory will study the improvement and development of the equipment of the laboratories, their extension and the construction of new laboratories. Thus we arrive at the project for a great Centre of Research for the Gas Industry, grouping together all the laboratories, physical and chemical. Since the preparation of this paper in 1947 this project has taken definite shape. The establishment at Landy was described in Communication I.G.U. 8 presented to the meeting of the International Gas Union in London by Professor Ribaud last June, and an abstract of the description was published in our columns in the issue of the *Gas Journal* of July 6.

AUSTRALIA'S GAS SUPPLY*

By E. S. FINLASON,
General Manager, Brighton Gas Company, Ltd., Victoria.

OWING to the distribution of population throughout the Commonwealth there are of necessity many small undertakings in the country centres, while all the larger undertakings are grouped in the capitals and the larger cities of the Commonwealth. This is clearly shown in the following statistics taken from the National Gas Association Statistical Year Book for 1947.

Taking the undertakings owned and controlled by the Colonial Gas Association, Ltd., and the Gas Supply Co., Ltd., as one unit in each case, there are 64 undertakings listed and:

		Mill. cu.ft.
2	undertakings produce over 5,000 mill. cu.ft. per annum with a total production of	21,224
5	undertakings produce between 1,000-5,000 mill. cu.ft. per annum with a total production of	9,086
3	undertakings produce between 500-1,000 mill. cu.ft. per annum with a total production of	2,368
7	undertakings produce between 100-500 mill. cu.ft. per annum with a total production of	1,680
6	undertakings produce between 50-100 mill. cu.ft. per annum with a total production of	435
7	undertakings produce between 25-50 mill. cu.ft. per annum with a total production of	251
4	undertakings produce less than 25 mill. cu.ft. per annum with a total production of	379
64		35,423

It will be noted that over 50% of the undertakings produce less than 25 mill. cu.ft. per annum each, and 80% less than 500 mill. cu.ft. per annum.

I am afraid that some of the members of the small and remote undertakings are inclined to think that their problems and interests are overlooked by the Institute. However I wish to emphasise that it is the aim of the Institute and the Council to do everything possible to assist every member, no matter what the size or the geographical position of the works.

What steps can we take as an Institute to raise the standard of our works and improve the efficiency of our undertakings so that we may continue to serve in our present form as a public utility in the highest sense of the word? First, I believe that there ought to be the closest co-operation between all the members of the Institute. We must view our problems as an industry and realise that the welfare of the smallest undertaking has an important bearing on the welfare of the largest. Secondly, the necessity for good prompt service to the public is of paramount importance.

With rising costs of materials and labour, increases in price of gas are inescapable if undertakings are to continue to function efficiently and pay a reasonable return on capital invested. While the public accepts increases in most commodities without protest, any increase in the price of gas raises a storm, despite statements in the Press clearly indicating the justice of the increase. I believe much can be done to offset this attitude by the provision of good service and by prompt attention to all complaints. I am aware that 'free' service as given by the undertakings at present is costly, but if efficiently carried out it surely becomes one of our best advertisements and probably our greatest goodwill builder.

Thirdly, we should provide only high grade appliances, and in this regard the National Gas Association is affording valuable assistance with standards of safety, efficiency, and durability.

At the present time undertakings have no control over the type of appliances that are installed in their area of supply. I am fully aware of the difficulties of overcoming this position but surely they are not insuperable. The adoption of Commonwealth wide standards capable of enforcement would in my opinion be very beneficial.

While I firmly believe in the marketing of appliances and the carrying out of installation work by gas undertakings, I consider that we should also seek the co-operation of hardware merchants and plumbers provided the necessary safeguards are provided as to type of appliance and quality of installation work.

Finally every endeavour should be made to introduce load building tariffs which will be strictly competitive. This is a subject which has been discussed for many years but outside certain country areas has not been implemented to any degree. In fact it appears that as an industry we are unable to agree on any uniform method of charging for our gas. There again it should be a matter of co-operation in order to arrive at definite basic and fundamental principles.

Gas an Expanding Industry

Sales of gas in Australia increased from 1939 to 1948 by 68%. During the same period the number of meters in use increased by 23%. It will thus be evident that during the period there was a very substantial increase in consumption per meter.

In 1948 the average consumption per meter throughout the Metropolitan areas of Australia approximated 30,000 cu.ft. per annum and in the provincial areas 25,000 cu.ft. per annum. The figures for 1939 were 23,000 and 16,000 cu.ft. respectively. The percentage in increases being Metropolitan 30% and provincial 56%. I have no doubt that the adoption of rational tariffs in the provincial areas has materially assisted in the large increase in those areas.

I feel that the consumption per meter can be materially increased and suggest that as a first step undertakings should obtain statistical data covering the type and number of appliances installed in each consumer's residence and once obtained kept up to date. The information should be followed by an active sales campaign and personal visits to consumers by properly trained salesmen would probably be the most beneficial. I do not mean salesmen of the 'high pressure' type, but men, and also women, whose objective would be not only the sale of additional appliances and the replacement of old, but the bringing about of a better understanding between the consumer and the undertaking.

The Governments of the States outside New South Wales in which there are coal deposits are investigating the possibility of using these coals for gasification purposes. In Victoria, Parliament recently set up an all-party committee to enquire into brown coal gasification. This Committee has completed its sittings at which expert evidence was tendered. The members of the Committee have reported independently to Parliament and the Premier made the following statement:

'The suggestion which has been accepted by the Metropolitan Gas Company and others interested is that we will proceed with the Lurgi process at Melbourne but instead of installing a large three generator plant the Company will proceed to install immediately—that is as soon as the order can be fulfilled—a one generator plant capable of producing 2,500,000 cu.ft. of gas per day. We hope that the plant will be ready by the middle of 1952 and it will then be able to satisfy Melbourne's gas needs for that year. In the meantime the Government intends to proceed with the setting up of a Fuel Authority at Morwell. The future development of the Lurgi gas making process will be at Morwell.'

I congratulate the Metropolitan Gas Company on its initiative.

I have already dealt with the progress of the Gas Industry but there is one disturbing feature which has been referred to on many occasions—namely, that no new gasworks has been established in Australia for many years, with the exception that certain towns have been linked by high pressure mains. There are at the present time several quite large towns with no gas supply whatsoever.

It was recently announced that the population of Australia now totals 8 mill. people and it is estimated that it will have

(*Continued on p. 341*)

* From Presidential Address to The Australian Gas Institute, 1949.

PRESENT-DAY DISTRIBUTION PROBLEMS*

By J. HOSKIN, Assoc.M.Inst.Gas E.,
Assistant Superintendent, Distribution and Transport Department, Leeds.

***EDITOR'S NOTE*:—The author gives a survey of the problems which face a distribution engineer and some of the methods which have been adopted to overcome them. It is only by solving them that full and effective use can be made of the increased manufacturing capacity which will soon be available.**

IN the last few years, those immediately following the war, there has been a tremendous increase in the demand for gas. This has become especially noticeable on the extremities of the system where pressures have become dangerously low due to the increased throughputs, causing greater pressure losses from the works or distributing centres. The cause of this heavier demand is due to the public becoming increasingly aware of the many varied processes to which gas can be applied to give efficient and economical results coupled with an unfailing service. This applies to the domestic, catering, and industrial fields. The reliability of our service is probably our greatest selling factor, so that it is the duty of all distribution engineers to maintain it; even endeavour to improve it where and when possible.

The present-day distribution system is the result of many years of gradual development of small mains systems. These mains represent a considerable proportion of the capital assets of an undertaking. Unlike any other engineering concern, it is neither physically nor economically possible to consider any extensive replacement of an existing system after about 30 years.

At the inception of distribution, the district could be fed by means of a single trunk main from a single-lift holder. Development took place which resulted in additional lifts being added with a governor to eliminate the effect of cupping and uncupping of the various lifts.

Still further growth by district development on the perimeter led to further extensions of frequently overloaded existing mains, resulting in many instances in the installation of low-pressure holders. These holders drew their gas direct from the manufacturing source via an independent main, or pulled their gas into stock from the district mains during the night. These stations then 'topped up' the surrounding district during the day. To keep within the statutory limit, it became necessary to lay larger trunk mains to carry the increased load or to investigate other means of reinforcing the supply to the existing mains system.

Several means were suggested and tried out :—

(i) Lay large diameter mains to meet the increased loads.
(ii) Raise pressure to meet the increased demands and so maintain the minimum at the points of low pressure.
(iii) Provide additional storage at the points of low pressure.

Over 50 years ago when labour was cheap and the streets were not congested with other services, it was possible to lay mains up to 36 in. in diameter to convey the increased volumes at the low pressures then available. Today, the cost and practical difficulties of laying large diameter mains in city streets have so risen that it is uneconomical to consider such a project. From this has sprung the practice of converting existing trunk mains and the laying of new medium sized mains of 18 in. diameter to operate at medium high pressures, say, from 20 in. to 60 in. w.g.

Trunk Mains

A later development was the laying of high or semi-high pressure mains to supplement the existing system through district governors. These mains were made entirely independent and distributed gas via governors to existing low pressure systems. As new development occurs, a new governor can be installed and the low pressure mains laid out to radiate from this governor. Such a system with adequately designed mains will ensure a satisfactory supply with a maximum pressure drop of 2 in. w.g. for all consumers within a radius of approximately one mile. By this means, each governor is able to feed a district, and is therefore able to function efficiently. The trunk mains pressure can be varied to suit conditions and is therefore fairly economical to operate. The districts can be supplied by either direct weight-loaded or gas-loaded governors. There are many methods of using an auxiliary system to increase the main governor setting and so avoid those annoying loops at peak load.

The system of loading which has always appealed to me, though I have had no experience of its use, is the one where a clock-operated cam is the means of loading the auxiliary governor. The system allows for any number of pressure changes to be made during the 24 hours. A small auxiliary governor is weighted by means of a small mercury filled container on the end of a lever arm. Partially immersed in this mercury is a rod connected to the clock-operated cam by a tracer wheel. As the cam revolves, this rod is lowered or raised inside the mercury container; the degree of immersion determines the loading of the governor. The cam is shaped in accordance with the desired pressure changes, and another cam can easily be made when conditions alter. This loader can have the added advantage of an alternative cam automatically changing from weekdays to Sundays.

Leakage of Joints

Many of the existing mains which are now working as medium pressure trunk mains were not specifically designed for this purpose, and in many cases they are working under conditions which are eight and even 10 times greater than those for which they were originally designed. The ordinary spigot and socket lead-jointed main is quite unsuitable for conveying these medium or high pressures unless tested with pressure, as the soundness of this joint depends upon the way in which the joint was made; otherwise, one is left in the hands of the efficiency (or lack of) of the jointer. The ordinary run lead joint is too rigid and the least movement due to variations in temperature or vibrations is sufficient to cause a leakage.

To avoid the rotting of the yarn, some engineers use tarred yarn, but the possibility of firing, due to too hot a lead, has resulted in the use of lead wool.

To enable a sounder joint to be made, the Lead Wool Company have developed a double collar joint. This consists of knocking-in some strands of lead wool before inserting the yarn. This prevents the gas having contact with the yarn, and so prevents it from rotting. The joint is finished off in the normal manner, using lead wool instead of run lead. This joint is stronger, uses less material, and is capable of remaining gas-tight under more arduous conditions. But even this type of caulked joint is subject to leakage and it becomes necessary to attend to the joints. To effect a permanent repair, several types of leak clamps have been devised. These consist of pressing a resilient rubber gasket against the face of the lead joint. They are very effective, but it is essential to 'face-up' the joint before assembling the gasket in order to ensure a permanent gas-tight joint.

Steel Mains

The increasing need of greater pressures resulted in new materials being used. The advent of the steel main with its welded joints seemed the solution to the problem. Here was a material of extreme strength, which could be easily made and transported in long lengths and yet could be handled by a normal mainlaying gang; could very rapidly be jointed; and

* From a Paper to the Yorkshire Junior Gas Association, January 21, 1950

would withstand pressures many times in excess of ordinary cast iron pipes, anything up to 60 lb./sq. in.

The chief advantage which these mains have over cast iron mains is their lightness for a given strength. This is obtained by virtue of the thinness of the walls, which is normally one-third that of cast iron mains. The effect of corrosion is greater and quicker, so that the life of steel mains is considerably shorter. To give these mains greater resistance to corrosion, they are double-wrapped with bitumen impregnated hessian and coated with a bitumen compound. To achieve the maximum adhesion to the pipes, it is essential that they are moisture free, preferably done while the pipes are still warm. The purpose of the hessian wrapping is to overcome the brittleness of the bitumen, but, even so, it becomes bruised. The damage is not always sufficient, however, to arouse suspicion or warrant rewrapping, but it may have been sufficient to cause an air space between the wrapping and the pipe. This is a weak spot where corrosion may begin under favourable conditions. Another point of weakness is adjacent to a welded joint where the heat radiated caused the pipe to expand. Upon cooling, the bitumen does not always maintain contact with the pipe. Bitter experience has shown that the life of these mains depends upon the soundness of the wrapping. Once this is broken, the life of the main rapidly lessens.

During the past few years many distribution engineers have had reason to regret the installation of these mains, especially on trunk high pressure mains. Many of these mains were laid in deleterious sub-soils, and the results of perforation are just becoming noticeable. Escapes quite frequently occur at the face of a joint, at the point where the factory-applied wrapping ends and hand-applied wrapping joins. I have seen cases where a 10 in. high pressure main has been almost severed by a series of tiny pit-holes. Another common cause of corrosion is where a main is laid in a soft sub-soil on the edge of a road where sharp-pointed stones, vibrated by traffic, push their way through the wrapping.

The distressing point about these escapes is that they occur on trunk mains, where it is almost impossible to arrange a shut-down without inconveniencing a large number of consumers, should an alternative supply not be available. Usually, it is only possible to shut down for a few hours, sufficiently long to make the escape gastight. A good plan is to have a supply of shaped metal plates available which can be clamped around the main, with an asbestos gasket to make a gastight joint. Pressure can then be restored and a permanent repair effected by welding the plate to the main, finally removing the clamps. Afterwards, the whole length of main exposed should be stripped and rewrapped with 'Denso.' Small perforations can be repaired by drilling and tapping, inserting a solid plug and welding it into position, once again taking care to rewrap with 'Denso.'

Spun Iron Mains and Joints

Spun iron mains fitted with mechanical joints offer many advantages over the old vertically cast mains, and their anti-corrosion qualities are far superior to those of steel mains. Many engineers are now utilising these mains for pressures up to 70 lb./sq. in. with specially strengthened syphons. The flexible joints are easily made by unskilled labour in approximately one-third the time of that required for an ordinary 'knock-up' joint. This is important to our industry, where a high proportion of its skilled men are retiring.

There are three main types of joints in use, but all are basically the same, consisting of a lead-tipped rubber gasket compressed by a gland ring into the annular space between the spigot and socket. These joints vary only in the method in which the gland ring is held in position.

In the Staveley bolt type joint, the gland ring is secured by means of high tensile cast iron bolts. Being made of the same material as the pipe, their life is the same.

With the Stanton screwed gland joint the gland ring is threaded and screws into the socket. The rubber is of tapered cross-section. The advantage of this type of joint is that, should the rubber ring become faulty, the gland ring can be withdrawn and an ordinary 'knock-up' joint made.

In the Stanton-Wilson joint the gland ring fits over the socket and is locked by a bayonet action. This joint requires a little more skill, as special tackle has to be used. It is more suitable for pipes of 12 in. diameter and over.

The use of these mechanical joints enables a high rate of progress to be maintained, and it has become increasingly the practice to extend the use of mechanical equipment for main-laying with a view to stepping-up progress, at the same time reducing the cost of excavating and back-filling.

Use of Mechanical Excavators

There are certain conditions which govern the economical use of mechanical means. These are :—

(i) Sufficient length of uninterrupted run for the excavator. All the time the machine is standing, the cost per yard is increasing. This is most essential if the equipment is on hire by the hour.
(ii) Sufficient number of bottom men and jointers available to keep pace with the machine.
(iii) Plentiful supply of material on site.
(iv) Test and purge frequently so that undue delays do not result.

For estate use, mechanical excavation is not always possible or economical, due to the fact that other services may be fouled. However, the present shortage of unskilled labour by all services warrants all parties coming to a working arrangement whereby a common trench can be used. The difficulty, of course, is the difference in levels of the various services and the fact that gas must be laid on a sound bottom.

It is, however, possible to come to arrangements which are agreeable to all. With a common trench excavated by a suitable excavator, I have seen 20 and 30 4-in. pipes with mechanical joints laid per day, and this under difficult winter conditions. Of course, a common trench can only be used where the local authority is prepared to get all site preparation done before allowing the building contractors on the site. The earth excavated by the water department usually acts as sufficient anchor to prevent the gas pipes from shifting while under test, although it is still necessary to provide extra anchorage at its ends or where it changes direction.

Air Testing

The old 'knock-up' joint could easily be tested with a soap solution, but with the flexible joint this is difficult by virtue of its construction. The only really effective way is totally to immerse the joint in water. This is best done with the aid of a special clamp made of rubber or canvas. Unfortunately, this is a laborious task. So that work is not unduly delayed by testing, especially necessary where mechanical excavation and back-filling is concerned, it is usual to test once a week, or more frequently if necessary, depending upon the location of the work. The section under test is pumped up to a pressure of approximately 30 lb./sq. in. unless specially strengthened syphons are used and a time pressure test taken.

A recording pressure gauge, as well as a visible gauge, should be fitted on the standpipe connected to the main under test. After the air compressor is shut off, the standpipe connections should be tested for leaks, including the recorder connections. The test chart should be allowed to run for 24 hours if possible. To help the engineer in assessing the soundness of the main, a recorder has recently been marketed which is capable of recording both temperature and pressure on the same chart.

To ensure greater safety in the matter of purging, it is becoming the practice to use an inert gas, such as CO_2. This can be supplied either from bottles of CO_2 or from a purging machine. A suitable purging machine, capable of delivering 5,000 cu.ft. per hour at an outlet pressure of 6 in. w.g., is marketed by W. C. Holmes and Co., Ltd., of Huddersfield.

Service Governors

Many undertakings are not so fortunate in having an easily sectionalised district, due to the fact that before naphthalene washing took place on the works it became the practice to interconnect as many mains as possible in order to reduce the possibility of a cessation of supply due to a blockage. This process was carried out over a period when little or no record was kept of the position of mains, and those that were recorded were never kept up to date. Thus, the task of splitting into districts has been made virtually impossible.

The solution to this problem appears to be to increase the district pressures and so help to raise the carrying capacity of the existing system. The disadvantage of this method is that consumers are subject to a variation in pressure, and those near to the works or points of distribution have unnecessarily high pressures. This results in district complaints of 'stoppages' or unsatisfactory functioning of appliances. To obtain a constant pressure, a service governor should be installed on the inlet to the individual consumer's meter or group of consumers' meters. A suitable single service governor is capable of withstanding inlet pressures up to 22 in. w.g.

The corrosion of services, both internal and external, has exercised the minds of engineers for a number of years. Recently, the problem of internal corrosion has become more acute due to the increased velocities inside the mains, resulting from the high pressures and throughputs. These have produced a scouring action on the internal surfaces of the mains, the resulting scale being carried forward into the services. Here it is deposited, causing an obstruction. This causes a falling-off in pressure, resulting in complaints.

Many excellent methods have been devised to clear these services with the least possible inconvenience to the consumer. These either remove the rust from the service by means of pressure or by suction. No doubt these machines give excellent results when the rust is a dry powder. The difficulty is that many undertakings are working without a dri-gas plant, and those that are are not able to deal efficiently with the total make. The effect of passing 'wet' gas into the district is to increase the conditions for producing rust, at the same time reducing the possibility of being able to remove it by the use of a pressure or suction cleanser. I have found that more satisfactory results can be obtained by disconnecting the service at the main, prodding with a spring steel wire, at the same time blowing air through from the meter end. This method ensures that the rust is removed and not pushed back into the main where it is still a potential source of trouble. The older method of using gas pressure to push the rust forward results in too much inconvenience to the consumer, especially if the service terminates in a cellar used for food storage.

The present high cost of reinstatement of public highways is making the clearing of stoppages an expensive business. I feel therefore that from a long term point of view it should be possible to make the supply of a moisture-free gas a standard condition of quality, in much the same way as naphthalene and sulphur content are controlled.

To give adequate protection to steel tubing, it should be double wrapped and the same care exercised in its laying as for steel mains. The life of these services is short—from 10 to 15 years or even less. Copper tubing has been used experimentally as an alternative and has been found to be more resistant to corrosion than steel, but also more expensive for equivalent bore. It must also have walls thick enough to allow the cutting of a B.S.P. thread. This extra cost often outweighs the advantage of the longer life, and I feel that green dash galvanised iron gives the same protection as copper and costs about the same as ordinary wrapped tubing.

High Pressure Storage

Gas is being distributed over increasingly greater distances, and this in many cases has required the provision of local storage at the terminal points. Many of these storage stations have to be situated on housing estates or in positions where the more orthodox L.P. holder would raise objections from the local residents and the town and country planning authorities. This need for a small easily camouflaged storage has led to the development of the H.P. storage receivers. These receivers are made of steel plate from ½ in. to 1 in. in thickness of either welded or riveted construction, which is several times thicker than the plate used in the water-sealed type of holder. Many of these holders have been in use for a great number of years, so that from this it can assumed that the life of a high pressure receiver will be proportionately greater.

Additional factors in favour of high pressure receivers are:—

(i) The paint will last longer because it is not subject to immersion in water. Painting can be carried out more quickly, consequently more cheaply.

(ii) No cuppings necessary, with a consequent saving in the provision of boiler and anti-freezing equipment. By virtue of this fact, stations can be fully automatic and unattended.

(iii) Lack of moving parts reduces general inspection and maintenance necessary.

Before placing a contract for a receiver, either welded or riveted, it is essential that an insurance company is acquainted so that it can give advice. The company provides inspection of the materials and workmanship at the factory, and in its report sheets acquaints the gas engineer with works progress. This enables him to plan his building and other work, and also ensures that the receiver, when completed, is acceptable to the insurance company.

Moortown H.P. Storage Station

This station is situated on the fringe of a large housing estate, so that it was necessary to comply with certain town and country planning arrangements to endeavour to retain the natural beauty of the surroundings. The receivers are sunk below the ground, which caused a great deal of trouble, as rock was struck. This had to be blasted, and then water was encountered which caused a halt, otherwise the receivers were to have been 5 ft. lower. Each of the receivers is capable of storing 166,000 cu.ft. of free gas at 55 lb. per sq.in., weighs 150 tons and is 24 ft. in diameter by 107 ft. long. To allow for expansion and contraction, the receivers are mounted on roller cradles with a fixed cradle at the pipe line end.

The receivers are charged with gas during the night period—11 p.m. to 6 a.m. when the district consumption is at its lowest, enabling gas to be taken from the mains on the outskirts of the district without reducing the pressure beyond a predetermined amount. A clock control switch is the prime factor which starts the plant to work at any set time provided (a) the pressure of the gas in the receiver is reduced previously, by district consumption, below 45 lb. per sq.in., and (b) gas is available in the district mains over and above the previously determined pressure. When these conditions coincide, the compressing plant automatically starts up and an electrically energised unloader operates on the compressor to enable the electric motor to gain 75% of its revolutions before compressing takes place. As soon as compression commences, a 'vacuum' governor, fitted in the auxiliary control system of the 14 in. Reynolds district governor, closes and so ensures that the plant does not churn gas from the receivers. This could easily happen if the governor was not kept closed. Each governor is capable of passing up to 250,000 cu.ft. of gas per hour, working with an inlet pressure variable from 1-55 lb. sq.in., and outlet pressure from 3 in.-6 in. w.g. As a safety precaution, each governor is fitted with a mercury sealed 'blow-off' on the outlet to prevent any excessive pressure building up on the district should a governor fail to function correctly.

Should one compressing unit fail to start when the previously stated starting conditions coincide, the second machine will automatically operate and a red warning light will remain illuminated continuously until the routine visit of the maintenance engineer, thus warning him that whichever machine he had arranged as No. 1 worker had failed and needs his attention.

The compressors are driven by shafting passing through a gas-tight stuffing box.

This safety precaution is to eliminate any possibility of an explosion or fire taking place in the event of a gas escape which could be ignited by an electric spark.

AUSTRALIA'S GAS SUPPLY — Continued from p. 338

increased to 9 mill. by 1954 and before 1960 the figure will be 10 mill. In view of the policy of decentralisation it is safe to estimate that a considerable proportion of this population will be located in country towns. If the gas industry is to continue to carry out its duty as a public utility on the present basis, that steps must be taken to see that an adequate supply is available in those areas.

HIGH PRESSURE DISTRIBUTION*

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EDITOR'S NOTE:—**The author points out that the technique of modern mainlaying must develop rapidly in all its phases in this country if it is to keep pace with the constructing of miles of high pressure mains for grid schemes and bulk supplies of gas. New methods and equipment must be given a trial and old methods, together with obsolete ideas must be thrown aside. Much can be achieved by the interchange of ideas between various undertakings and the study of American and Continental mainlaying practices. Today, due to the integrating of supplies on a large scale and the bulk purchasing of gas, distribution has become one of the most important phases of gas engineering, and the thoughts in this paper are based on the writer's actual experience in the laying of 25 miles of high pressure mains up to 24 in. diameter.**

CARE should be taken to ensure that the mains are large enough to carry the demands for years to come. At this stage the economics of the scheme are thrashed out. The sizes of mains can be calculated reliably by using Stephen Lacey's adaption of Unwin's formula and cross checked by Cox's high pressure formula. A rough idea of the proposed route is necessary to obtain the estimated length of main for purposes of size calculations. On all high pressure mains after construction, tests should be carried out to check with the theoretical flows and pressure losses found by the initial calculations. Valuable data can be obtained in this manner. Today reinstatement charges can equal the cost of mainlaying on certain size mains; therefore built-up areas should be avoided unless it is absolutely necessary to proceed through them. A route giving regular gradients is to be preferred to one which resembles a switchback, as syphons add substantially to the cost of the main.

Once the alternative routes have been decided upon, plans should be drawn up on a suggested scale of 1/2500, and these submitted to various authorities—e.g., electric, water, Post Office, sewers, highways, requesting them to mark on the plan the positions of their cables and mains, &c. Also the town planning and housing authorities should be consulted in view of any expansion of housing which may effect the proposed route of the main. Trial holes should then be carried out to the depth of the proposed main and should take the form of a slit trench across the line of the main.

From the above information, the final route of the main can be fixed. Immediately work should commence on wayleaves. Friendly relations between the gas undertaking and its consumers in the past play an important part. In my own undertaking due to this we have experienced no difficulty in obtaining easements for 25 miles of high pressure mains. Having obtained the easement from a certain land-owner, the work must be done in a manner so as to cause as little damage as possible, while complaints from tenants or land-owners must be dealt with immediately. If this policy is adopted then the claims for laying through property are negligible.

A detailed survey of the route should be carried out to prepare a schedule of specials, syphons, and quantity of main required. The route is levelled and graphs are drawn up giving the contour of the ground. From these graphs the depths of the proposed mains are decided and plotted. Thereby, the number of syphons required can be accurately found. The actual mainlaying should not commence until all specials, valves, caps, and plugs are on site and the scheduled rate of delivery of mains is settled and the first consignment also on site. The whole mainlaying organisation can be thrown out of gear for the want of a few bends, or caps and plugs for testing purposes.

From this detailed survey, the sections of main to be laid close or open should be plotted. By close working is meant the laying of mains in short sections in built-up areas where the testing should be carried out at the conclusion of each day's work, or at least every week-end, depending upon the interference of the operations on the general public, traffic, or property. Open working is usually cross-country where the main can be conveniently tested in 400 yd. lengths.

Supervision is an important point, and the person responsible for this can do a great deal to keep down the cost per yard of the completed main. One person should be in complete control of the whole mainlaying organisation, and all the various aspects of the work should pass either directly or indirectly through his hands. The reason for this is that he will have a complete day-to-day picture of the whole set-up and any weak points in the organisation can be quickly spotted and remedied—for example, a delay in the flow of materials or machines idle through working on an uneconomical section of the route.

I suggest that a considerable capital saving can be acquired by setting up mainlaying organisations to execute the laying of grid and bulk supply mains by utilising direct labour. The Wales Gas Board is alive to this particular problem, but until we know the outcome of its deliberations, we must continue to present for mainlaying work by contract, a Standard Specification, and conditions of contract. My own undertaking has recently revised its standard specification for contracts and it is a comprehensive document. I believe that it would be advantageous to have drawn up a general standard specification throughout the country, for work with contractors and by direct labour, and that these should be circularised to each individual undertaking.

A Special Techniqne

High pressure mainlaying is very different from the laying of low pressure mains. High test pressures demand a much greater degree of care in the laying of the mains to avoid stresses being set up. The joints must be sound at a more exacting test and also the large potential energy stored in the main under test warrants great respect, and a set code of conduct for persons engaged on the line.

Manufacturers take all necessary precautions to ensure that pipes leave their works in a sound condition. Therefore, from this stage until the pipes have been laid and jointed their handling must be done with extreme care. This is vital as far as spun iron pipes are concerned. Many cases of pipes failing under test can be attributed to improper handling. The resultant cost of testing a section of main, removing a defective pipe, replacing and re-testing, can weigh heavily on the final cost per yard of main laid.

My own experience of the difficulty of locating pipes which receive impact damage due to improper handling is as follows: All pipes, when slung prior to being lowered into the trench were sounded. The section placed under test, to our knowledge, had no defective pipes. When the test pressure reached 30 lb. there was no apparent leakage. The pressure was raised to 40 lb./sq. in. and left overnight, and the calculated leakage was 2 ft. per hour on a section of 15 in. main, 500 yards long. Then the pressure was pumped up to 50 lb./sq. in. and immediately it became apparent that a serious leak had developed. It was located and the pressure released. On exposing the main, a longitudinal split 9 in. long was found at the centre

* From a paper to the Wales and Monmouthshire Junior Gas Association January 11, 1950.

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of the pipe. The pipe was subject to a complete enquiry and the verdict was that the pipe had been subjected to impact damage.

All pipes arriving at site should be examined for cracks and flaws by slinging and sounding, but, as already stated, a partial fracture is hard to detect by this method. Another method is the chalking of suspected pipes and hammering. Any crack will then be revealed by a black line in the chalked areas. Radar methods are being used successfully in this country to locate flaws on steel girder work and probably could be adapted to assist in locating partial cracks on gas mains. Any pipes suspected of being defective must be discarded or placed on the end of a section under test, where it can be easily removed if it has failed under test.

Hand Labour Still Necessary

The shortage of labour and higher rates of the unskilled workmen have encouraged mechanical plant for mainlaying. But to obtain the maximum benefit from these machines, a considerable amount of hand labour is still required to enable the yardage laid per day, per machine, to warrant the extra cost of the machines.

The minimum cover for a high pressure main should be 2 ft. 6 in. The only exception to this rule would be if, for a very short distance it cannot be adhered to, then the main must be protected by a concrete mat. It is unsound policy to lay shallower than 2 ft. 6 in. when laying across country, as with the modern mechanisation of farm equipment the main can be seriously damaged by heavy machines sinking in soft ground.

The width of the trench should be kept as narrow as possible. Wide trenches need more labour with the resultant increase in cost. It is far better to work to the rule of 6 in. on either side of the pipe, and convenient joint holes cut out. The bottom or bed of the trench should be cut so that the pipe is laid evenly throughout its entire length in virgin soil except at joint holes. Where the main is to be laid in rock or a corrosive subsoil, then the bed should be cut 6 in. deeper than required and filled back to the required level with a clay subsoil or concrete.

It is advisable before the mainlaying commences to take representative samples of soil where there is any doubt as to the effect of the subsoil on the main. These samples should be sent for analysis. The results will show whether the main has to be protected or not.

Mainlaying on Railway Embankment

Recently we had to lay a section of 24 in. high pressure main alongside a railway embankment in made-up ground. The ground consisted of very fine ashes, and due to the extra cost of carting soil to replace the existing ashes, together with being informed from a reliable source that the embankment had been in existence for over 60 years, it was decided to send samples of the subsoil for analysis. The report showed that it contained a P.H. value of 8.0 and was alkaline. The second sample taken from the same embankment was acidic in nature. It was stated that there would be a definite corrosive action by the sub-soil.

The American National Bureau of standard field tests carried out the testing of various metals in various subsoils and their result of a 6 in. cast iron main buried in cinders, with the soil of P.H. value 8.0 and slightly alkaline showed the main completely destroyed in 9.2 years, the rate of pitting being 27.1 thousandths of an inch per year. It would be a sound scheme to build up a soil-testing station to serve each area board, where samples can be sent and a quick analysis carried out.

Usually spun iron and steel pipes, Class B, are used on high pressure and low pressure gas mains. Owing to the steel pipe being more susceptible to the effects of corrosion, I suggest that Class C tubes for steel be the standard for high pressure work.

The main, when laid, should have a minimum fall of 1 in. in 100 ft. and on large size high pressure mains it may be more economical to lay the main through a short section of raised ground a little deeper than to insert a high pressure syphon, which is a costly item. It has been advocated by some engineers to dispense with syphons on high pressure lines. This would result in a considerable saving in syphons and a speeding up of mainlaying due to there being no need for exact levelling of individual pipes. But unless the operating pressures of the main are in the region of 30 lb./sq. in., with sudden after-cooling of the gas after compression it is advisable to insert syphons.

Jointing

The essential of a good joint is cleanliness. The spigot should be wire-brushed and it has been found that a coat of varnish paint on the spigot will assist in the preparation of a sound joint. Very small leakages have occurred on joints which were thoroughly cleaned, but on disconnecting small indentations were found in the spigot. A coat of varnish forms a smooth film over these. The seating of the socket should also be scraped to remove any irregularities and provide a smooth surface. When laying flexible joints, do not take up the full deflection as any further movement or strain tending to force the pipe in the direction of the original deflection will tend to cause a metal-to-metal bearing of the pipes with grave liability of fracture. All pipes and specials stored in the open for any length of time should be protected with a coat of grease.

The Stanton flexible bolt type joints which we are at present using on a 24 in. main are very sound joints, except for one case in which a leaking joint was located and the trouble found to be a small quantity of sand at the bottom of the seating of the socket. We have not experienced any trouble due to the joints. Due to their ease of setting up and making, I believe that this type of joint will in future supersede the Stanton-Wilson joint.

A suitable method of slinging gas mains is the American practice of utilising two wide canvas straps around the main connected by a spreader bar. With this attachment, the pipe is raised horizontally and can be held in position truly when entering home against the pipe already laid.

The method of backfilling and excavating a trench is important, yet many mainlaying gangs seem satisfied to carry it out haphazardly.

The question of inserting valves in the line of high pressure mains has recently been discussed by several engineers. My own view is that valves should definitely be inserted on a line of high presure main—one every mile across country and also before a main crosses railway property. Being able to isolate sections of mains was a great asset during the war, and it is important to do so now for reasons of de-railment of railway traffic and accidents to any sections of a main. The next point is, unless the valves can be operated from fully open to a fully closed position, by a few turns of the spindle, then the advantage of installing them is lost. Correctly designed venturi valves could be used in this country with great advantage.

Electrolytic Corrosion

Electrolytic corrosion is a troublesome problem in the laying of gas mains. I am commencing in my own undertaking a detailed survey to find the polarity of the main at several points in relation to the surrounding ground. Readings will be taken by inserting various instruments in series with the main and a test bar driven into the ground to the same depth of the main and a constant distance from it. Corrosion spots are to be found where the current is alternating or the main is at a higher potential than the surrounding subsoil. Therefore, the main acts as an anode. It has been established that the amounts of various currents flowing to a gas main from various sources are large. These currents meet resistance at joints. Each length of main where the main acts as an anode should be bonded to the other to allow the current to continue uninterrupted. Earth bars should be set up at points along the main in suspected areas.

Unless the personnel engaged in high pressure mainlaying realises the different technique required between high pressure and low prssure laying and jointing, then the cost of testing the main will reveal astounding results and will give an added

cost per yard out of all proportion to the capital involved in the laying of the main. The testing of individual joints must continue while the present method of testing is being carried out. In some mechanical joints the annulus between the socket and spigot is too large for the soapy water test and the Felton bag employed as a water seal test has been used. When laying large mains across country, the carrying of sufficient quantities of water to test with this apparatus constitutes a difficult problem. This, coupled with the time taken to fix and dismantle the bag, is uneconomic. To overcome this difficulty, my undertaking has devised a method of testing joints as follows: A thick rubber band was placed around the main. To the side face of the band was gummed a rubber tube and to the bottom of the band was gummed sorbo rubber. The band was then pressed firmly against the socket of the joint and tightened by means of an attachment at the top. The tube was then inflated to form a seal. This greatly reduced the amount of water necessary for each joint and also speeded up the testing considerably. The use of amyl or ethyl mercaptan also assists in the location of leakages, but on a long section it is advisable to release air from the other end of the section until the pungent odour is obtained. This ensures an even distribution of the mercaptan throughout the main.

TARMACADAM AND THE ROAD ENGINEER

IN the course of a paper to the North Eastern Branch of the Institution of Highway Engineers, at Durham, this month, **Mr. W. E. Cone**, Technical Adviser to the British Road Tar Association, remarked that in dealing with the subject of British Standard Specifications for tarmacadam, it is first necessary to consider the functions of the road engineer and the manufacturer of the material. If the road engineer is to profit fully from standard specifications there should be no ambiguity in specifying the requirements. Apart from quoting the particular standard specification, the road engineer should specify the grading of the tarmacadam by reference to one of the gradings given in the tables of the standard appropriate to the type of construction and number of courses. It is also the duty of the road engineer, as the purchaser of the tarmacadam, to see that the material conforms in all respects to the requirements of the specification. In this connection the provision of testing facilities costs money, but the cost should be repaid many times by the increased life on the road obtained with properly manufactured materials. The amount of testing which the engineer will have to do will depend on the control exercised by the manufacturer; the better this latter control is, the easier will be the task of the engineer in carrying out check tests.

There is no short cut to perfection in the production of tarmacadam to standard specifications; it is necessarily a manufacturing process in which plant and equipment, sequence of operations, factors affecting quality and conditions to be fulfilled, all play a very important part. Quality of production can only be assured by continuous supervision of the manufacturing process and the regular testing of the materials. Only when the manufacturer has instituted a system of technical control of quality is he in a position to feel confident that the requirements of the specification have been fulfilled. On the other hand, lack of these facilities tend to result in a makeshift compromise between what is best and what is available. It follows, therefore, that the fullest use of technical control in the manufacture of tarmacadam will lead to a higher standard of efficiency in production and to improved or more consistent quality.

In addition to covering, in detail, the requirements of materials and manufacturing procedures for various types of tarmacadam, the standard specifications also deal with the transport and laying of the materials. For the guidance of road engineers, a table is included in each standard giving the approximate rate of cover for tarred aggregate of various consolidated thicknesses. Particulars are also given of the appropriate British Standards which describe the methods to be adopted in the sampling and testing of the materials. Thus, progressively, the conditions governing the manufacture and laying of the materials are set out in sufficient detail in the standard specifications to ensure the best results if the correct procedure is followed. To this end, it is essential that the plant and equipment should be designed to reduce the variability in operations for which the human factor in the tarmacadam industry is very often responsible. The extent to which these deviations from the standard requirements take place will be reflected in the life and behaviour of the materials.

The ideal aggregate for tarmacadam construction should have high mechanical strength, good crushing characteristics for the production of a high proportion of cubical particles, low porosity, and a non-crystalline surface. While it is desirable to select aggregates in keeping with these characteristics, experience has shown that the type of construction and the amount of traffic may permit of the use of aggregates that are not of the same high quality. In such instances, it may be necessary to make some slight modifications to the standard gradings compatible with the available types of aggregate. Generally, however, the aggregates should comply with the requirements specified in the appropriate British Standards.

No features of the design of a tarmacadam mixture have a greater influence upon the stability, durability, and the surface texture of the finished construction than the grading of the aggregate. The need for a non-skid, durable, and stable road surfacing is obvious. The gradings of the materials given in standard specifications cover base-courses, single-course work, and wearing courses of open, medium, or close texture respectively. Greater latitude is provided in the gradings of the materials for base courses which are used in two and three course construction, but the density of the mixed aggregate progressively increases for single course work and wearing courses. Here, perhaps, it is advisable to point out that with gravel aggregate a proportion of fine aggregate is essential for both base courses and wearing courses, and it is not, therefore, possible to prepare a satisfactory open-textured gravel-tar wearing course. Provision is made in all the standards for the use of filler which improves both the density and stability of the mixtures. In addition to the filler complying with the grading requirements laid down in the standard, its fineness can be determined by measuring bulk volume of a standard weight of the filler in pure benzene.

As a guide to the road engineer, the types and viscosities of tar binder for different forms of construction are detailed in the standard specifications. These cover the requirements for hot, warm, and cold laid materials for summer and winter application. Among the properties of tar binders, viscosity is of paramount importance. For a given type of surfacing, the viscosity should be selected in line with the traffic density and the climatic conditions under which the material will be manufactured and laid. In general, it has been found that Types A and B tar are suitable for the types of tarmacadam which are at present in most demand. The guidance of the road tar supplier should be sought in connection with the supply of tar/bitumen mixtures. The British Road Tar Association's Certification Trade Mark for Road Tar is now well established, and supplies of tar binder bearing this Mark are guaranteed as complying with the requirements of B.S.S. No. 76 : 1943 : Tars for Road Purposes.

In spite of the marked advances in the quality of tar binders and the design of tarmacadam mixtures for wearing courses, road engineers have been slow to take advantage of these improved forms of construction. Cost may have something to do with this, but the author believes that the old idea still persists among some engineers that the performance of these tar wearing courses or carpets will be no different from that of the old tarmacadam 'toppings' (open-texture) which is still in demand today. Experience has shown the wisdom of specifying wearing course materials by reference to Tables 3 and 4 (medium-texture and close-texture respectively) of B.S.S. No. 802 and Table 1 of B.S.S. No. 1241 for Gravel Tarmacadam. The adoption of these types of surfacing will ensure many years life before surface dressing is necessary.

Complete knowledge of the requirements laid down in British Standard Specifications for Tarmacadam is essential both on the part of the manufacturer and the engineer, so as to ensure not only the most suitable form of construction for the contemplated road surfacing work, but also to ensure that the quality of the materials are up to the required standard. There is no substitute for knowing.